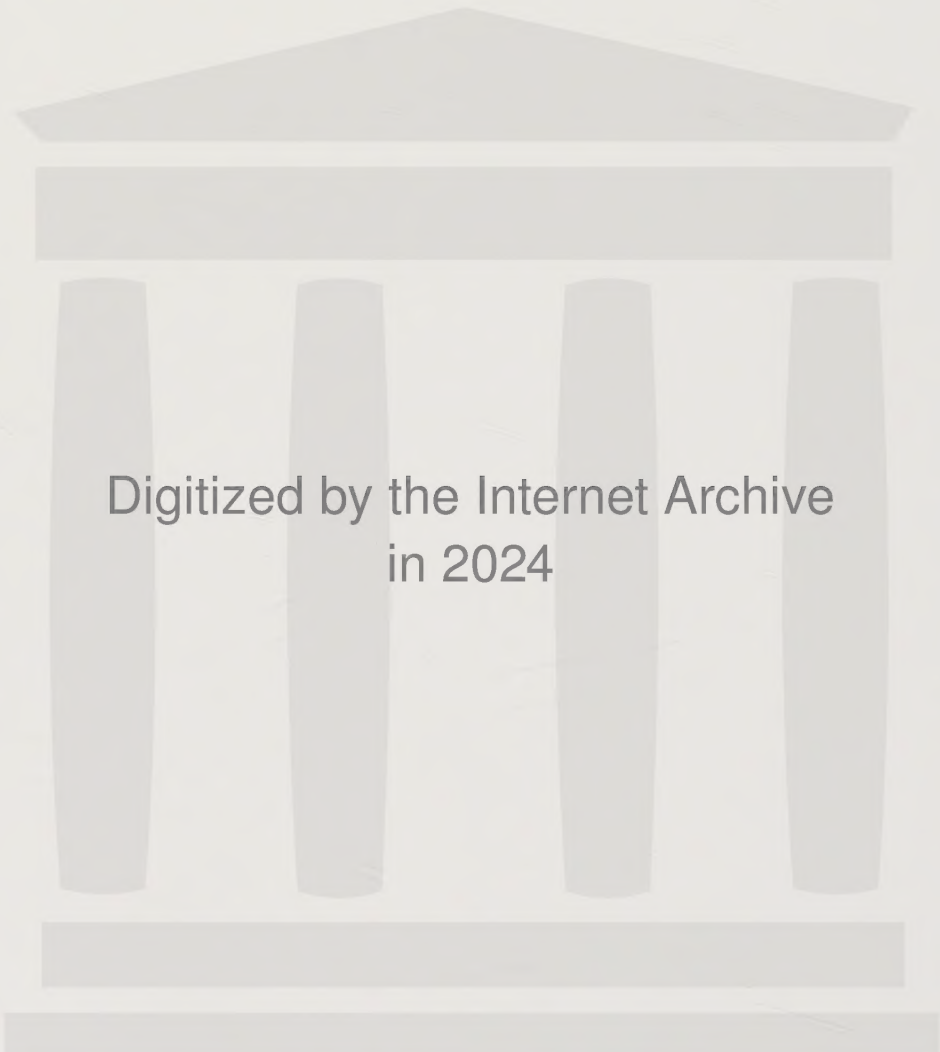
Medicine, Science and Technology

The natural history of Norway: ... In two parts. Translated from the Danish original of the Right Revd. Erich Pontoppidan, ... Illustrated with copper plates, and a general map of Norway. Volume 1 of 2

Erich Pontoppidan



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ECCO
PRINT EDITIONS

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NATURAL HISTORY

OF

NORWAY:

CONTAINING,

A particular and accurate Account of the Temperature of the Air, the different Soils, Waters, Vegetables, Metals, Minerals, Stones, Beasts, Birds, and Fishes; together with the Dispositions, Customs, and Manner of Living of the Inhabitants. Interspersed with Physiological Notes from eminent Writers, and Transactions of Academies.

In TWO PARTS.

Translated from the DANISH ORIGINAL of the

Right Revd. ERICH PONTOPPIDAN,
Bishop of BERGEN in NORWAY, and Member of the Royal Academy of Sciences at COPENHAGEN

Illustrated with COPPER PLATES, and a General Map of NORWAY

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III
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The AUTHOR'S PREFACE.

THE chief deſign of this preface is, to lay before the reader my motives for attempting a Natural Hiſtory of Norway, together with the opportunities and encouragements which have concurred towards the accompliſhment of my deſign, as ſuch information may, in ſome reſpects, be neceſſary in the peruſal of the work

My principal motive was, to promote the glory of the Creator, by a contemplation of his works In the inſtructive book of nature are many leaves, which, hitherto, no mortal has thoroughly peruſed, though the preſent times are bleſt with the happy advantage of all the important diſcoveries made in natural philoſophy, ſince the commencement of this century, which are ſuperior in number and merit to thoſe of many preceding ages Theſe have been chiefly promoted by the learned Societies now flouriſhing in almoſt every country in Europe, who have liberally encouraged, directed, and excited enquiries into nature, and by the periodical publications of obſervations, objections, and experiments, have communicated to the world ſuch important truths, as reſulted from them

It is not my preſent purpoſe to enquire, how theſe diſcoveries have been applied to various ends by perſons of different opinions, I ſhall only obſerve, that devout men have taken occaſion from them to expreſs, in the fulneſs of their hearts, their faith and love to the great Creator, by applying their natural knowledge, to the ſupport and illuſtration of this greateſt of all truths, "There muſt be a God, and he muſt be almighty, omniſcient, and infinite in goodneſs, and though he dwells

dwells in a light inacceſſible to any mortal eye, yet our faculties ſee and diſtinguiſh him clearly in his works". In this reſpect I have the moſt profound veneration for a Boyle, a Nieuventyt, a Fenelon, a Scheuchzer, a Derham, and the like great and excellent perſonages, who having been no leſs conſpicuous in the ſanctity of their lives, than in their mental abilities, will doubtleſs find a place among thoſe, or in preference to many of thoſe, to whom the prophet Daniel promiſes a more exalted degree of glory.

It is true, that the rational part of the heathen world were not unacquainted with the firſt principles of natural religion, and conſequently theſe are of themſelves inſufficient for the immediate and perfect converſion of ſinners, or the attainment of any degree of that ſalvation reſerved for the members of Chriſt's myſtical body, who live in a more ſhining-light, and have more abundant offers of grace But it is equally true, as the Apoſtle affirms, *he that cometh to God, muſt firſt believe that he is, and that he is a rewarder of thoſe who diligently ſeek him* A general belief in God, as the creator and preſerver, as the rewarder and avenger, muſt be preſuppoſed, before any faith in the Son of God, the Redeemer, can take place; conſequently the firſt is the baſis of the other articles, and though a miniſter of the Goſpel is not to be lightly carried away by the ſtream, or ought not to follow the crowd of mere philoſophic moraliſts, who purſue vain glory in ſcience, falſly ſo called, and in contradiction to the mind and example of St Paul, *are almoſt aſhamed of the goſpel of Chriſt, which alone is and will continue to be the power of God unto ſalvation*, yet it becomes them as little to deviate on the other hand, into a diſregard and contempt of natural truths, and of the occaſion which they may draw from them, of promoting the glory of God, among many whoſe taſte and capacity reach no further than ſenſible objects and not having been found faithful, even in theſe leſſer matters, are not therefore intruſted with greater *If*, as our Saviour ſays, *we believe not what is ſaid to*

us of earthly things, how ſhall we believe when he ſpeaks to us of heavenly things?

I am therefore inclined to think, that neither I nor my brethren tranſgreſs the bounds of our miniſterial office, by inveſtigating and exhibiting natural truths concerning the works of God, which, like his word, are Jehova's. I am rather of opinion, that a ſupercilious neglect of ſuch truths, in this critical age, is one of the cauſes of that contempt, with which the Freethinkers, as they arrogantly ſtile themſelves, look on the miniſterial function

If phyſical knowlege be not, like godlineſs, *profitable to all things*, yet it is ſo to many, and in a certain degree to moſt things A civilian, in order to a juſt ſolution of a point in law, muſt previouſly have a competent intelligence of the fact, * and this is not always to be had from a formal depoſition, which is frequently contradicted by others of equal authority, but in many caſes, he may be conſiderably aſſiſted by a perfect inſight into the connexions of nature, which will teach him to reject impoſſibilities, which others would obtrude upon him for certainties, and not to attribute to any cauſe, however plauſibly alledged, what may much more reaſonably be ſuppoſed the effect of ſome other cauſe, though unknown

The utility, I ſhould ſay the abſolute neceſſity of this ſcience to medicine, needs no tedious proof, the alliance between natural philoſophy and medicine being univerſally known, and the whole materia medica being properly res phyſica This is ſufficiently confirmed by our eminent phyſicians, Wormius, Bartholin, and Borrichius, who were alſo conſummate naturaliſts But my more immediate aim, is to repreſent the advantages of natural knowlege to thoſe who apply themſelves to theological ſtudies, with a view of directing others in the way to ſalvation The firſt knowlege requiſite in them, is the knowlege of human nature, for grace and nature are the two great objects, which it is incumbent

* See an ingenious piece in the Hamburg magazine, under the title of Arguments on the uſefulneſs of natural philoſophy in the ſtudy of the law, Vol. IV. p. 27.

upon them to diſtinguiſh on all occaſions, when they undertake a cure of ſouls In the next place, they muſt learn to know God from his other great works, which proclaim his being, and attributes, as well as from his wiſe and tender œconomy in the government of all his creatures If they ſhould prove unacquainted with this branch of knowlege, then they are more ignorant than even the heathens, according to the teſtimony of St Paul himſelf, which is accompliſhed by the writings of Pagans How admirably among others *, Derham, and Nieuwentyt †, have applied natural philoſophy to an unanſwerable confirmation of revealed truths, is well known to thoſe who have peruſed their excellent works with attention, and have from ſuch peruſal, either acquired their firſt belief and love of God, or found thoſe religious habits greatly ſtrengthened and animated Moreover, a religious man, whoſe profeſſion turns his attention to other ſecular ſciences, muſt confeſs, that the delight of natural enquiries is greatly heightened to him, by an advantage which at firſt he did not expect, by the confirmation of his belief, and thus he is encouraged to purſue his reſearches, by the repeated ſatisfaction with which they are attended Not to mention the occaſion which a naturaliſt may take from his ſcience, to remind himſelf and others of their duty towards God and their neighbour, and this agreeably to the method of the prophets, and the example of the great prophet Jeſus himſelf, who referred thoſe who are intemperately ſollicitous about worldly things, to the fowls of the air, and the lilies of the field, the diſobedient to the oxen, and aſſes, which know their maſter, the ſlothful to the induſtrious pattern of the ant,

* Particularly, in his phyſico theology, or a demonſtration of the being and attributes of God from his works of creation being the ſubſtance of ſixteen ſermons preached at the lectures founded by the honourable Robert Boyle

† In their learned and devout works, the religious philoſopher on a right uſe or the ſtudy of nature to the conviction of atheiſts and infidels This conviction ſhould be an expected incentive to their researches, as, *without the leaſt hypocriſy* I can ſay of myſelf that the [illegible] Of the knowlege of the eternal, inviſible Being, who is the ſcope and ſpirit of all the truths delivered by the prophets and apoſtles, and the [illegible] by which others into may be gained not only infallibly direct my notes the ſtudy of natural hiſtory but leads all the labours with which it ſeems to be attended and enlivens the converſation of perſons of the ſame taſte Henkels Pyrilolog , or hiſtory of fire Chap v p 301

and

and the negligent to the bird which knoweth its ſeaſon Thus the works of God ſerve for a baſis and confirmation of natural theology, even as revealed truths are grounded in his word, and this hath induced ſome able men of our times to follow Derham's excellent plan, whoſe phyſics, and aſtro-theology were no ſooner publiſhed, than others adopted the ſyſtem, every one was ſtirred up to apply his particular knowlege to the diſcuſſion of ſome point of natural hiſtory, and exhibit ſuch an account of it, as ſhould tend moſt to ſpread the knowlege and glory of the Creator Theſe endeavours by no means deſerve to be conſidered as unneceſſary or ſuperfluous, for all who are deſirous of a more intimate acquaintance with the works of God, as arguments of his exiſtence and attributes, have no time, or opportunity for that circumſtantial examination of every part, which hath been undertaken and executed by Fabricius, in his pyro- and hydro-theology; Alvard, in his bronto-theology, Zornius, in his pitano-theology, Rathleff, in his acrido-theology, Leſſer, in his litho- and teſtaceo-theology, &c

I heartily join with the celebrated Linnæus * in wiſhing, that even thoſe gentlemen in the univerſities, who are not peculiarly deſtined to phyſic, or the like, but to the ſtudy and promulgation of the word of God, in ſome miniſterial office, were directed to apply ſuch a part of their academic years to phyſics, as may equal, if not exceed the time ſpent in metaphyſics, and logic, theſe laſt not being ſo indiſpenſably neceſſary and uſeful as the former, eſpecially to thoſe who are called to attend a country pariſh Here their natural knowlege will not only furniſh them with many clear arguments, and edifying reflexions to themſelves and their

* Monſieur Linnæus commence par une harangue, qui lui dicte la vivacité de ſon inclination, pour l'hiſtoire naturelle Il s'attache à la félicité des peuples, dès qu'elle a été portée à un certain degré de perfection Il s'addreſſe aux puiſſances, et les ſupplie d'introduire une ſcience auſſi utile dans les univerſités On y enſeigne la logique, la metaphyſique et d'autres ſciences de theorie, dont l'utilité eſt extrémement éloignée du bien public, pendant qu'on ne devroit pas négliger l'hiſtoire naturelle, qui enrichit une nation, parce qu'elle lui fait connoître ſes richeſſes Il ſouhaiteroit ſurtout que les jeunes gens, qui ſe deſtinent à la vie eccléſiaſtique, puſſent ſe procurer une teinture de cette aimable ſcience Elle les rendroit chers la ſolitude de la campagne, et elle leur feroit faire des découvertes, que les Divins des villes ne ſont pas à même de faire, Biblioth Raiſonnée, Tom xxxviii p 1

hearers,

hearers, of which we have inſtances in many religious books of that kind, but it will beſides prove a liberal amuſement in their ſolitude, it will enable them, by much greater opportunities than the learned enjoy in towns, to make uſeful diſcoveries or improvements, from the products of nature, to the laſting benefit of their country, which it is their duty to promote. I ſhall mention only one thing, which here in Norway might be of the greateſt importance, I mean ſuch ſkill in metallurgy, as to know the ſpecies of ores and minerals, to make little experiments by fuſion, and thus to form a judgment of the intrinſic value of a mine, and how far it will anſwer the expence of opening. He who is poſſeſſed of ſuperior knowlege and penetration, may in this country, ever meet with many latent things, which might long ſince have occaſioned much thought and reflexion, had they been exhibited earlier to public view and examination.

This leads me to my other motive, for attempting a natural hiſtory of Norway, which carried me thro' it with infinite delight, though I wanted the materials, the time, and the opportunities requiſite for an eſſay of this kind. In the annual viſitations of my dioceſe, which lead me into every part of this province, and ſometimes form a journey of an hundred Norway miles, I have heard authentic accounts of natural things, and ſometimes have ſeen the originals themſelves, which being unknown to me, put me upon enquiring whether they were ſo to others, or whether they had a perfect knowlege of them? The latter being ſeldom the caſe, it was natural to wiſh the improvement of that knowlege, eſpecially as thoſe mountainous countries are diſtinguiſhed from others by containing many things, which are met with in the province of Dauphiné in France. I refer the reader to the ninth volume of the Memoires de l'academie royale des inſcriptions et belles lettres, where he will find the following paſſage, "Nature has beſtowed on every province ſome diſtinguiſhing advantage, and the curioſities of each country are proportioned to the number and nature of the alterations it has undergone. Conſequently,

quently, in provinces full of mountains, rocks, grottos, ſubterraneous cavities, and minerals, the ſpeculative mind is entertained with many ſuch natural phenomena, as are not to be found in other parts.

This obſervation of M Lancellot, is entirely applicable to Norway, and more eſpecially to that part where providence has been pleaſed to ſettle me, which, according to its name, almoſt wholly conſiſts of mountains, in which, few parts of Europe can be compared to it, and conſequently, according to the above obſervation, few contain more remarkable naturalia Even Norwegians themſelves, who reſort hither from the other provinces, imagine themſelves in a foreign country, not only on account of the continual high mountains they meet with, but in reſpect of the different and very unwholſom air iſſuing from off the ſea and ſettling between the mountains, from whence it cannot eaſily be diſſipated.

But Norway, conſidered in general, in the ſingularia naturæ et providentiæ, ſurpaſſes moſt countries, and not only in its inanimate treaſures, ſuch as metals, minerals, and vegetables, but in the various kinds of beaſts, birds, and fiſhes; and particularly of the laſt, ſcarce any parts of the univerſe afford ſuch a diverſity and abundance But theſe ſuperior advantages are not eſtimated as ſuch by the inhabitants, who daily enjoy, and therefore are too apt to diſregard them Foreigners ſeldom viſit us, unleſs they are ſeamen and merchants, and theſe have little elſe in view, than the lucre of their profeſſions Northward of us the people are too unpoliſhed to encourage a traveller to take the tour of the country, which hath been the means of clearing up the natural hiſtory of other countries

On this very account it ſeems the more expedient, that ſuch of our Daniſh nobility, and of our literary youth, who travel at a very great expence to viſit foreign countries, ſhould be firſt obliged to take, at leaſt, a half year's tour through this kingdom, which is ſo cloſely united with Denmark If the travels of

theſe young gentlemen are ſaid to be undertaken upon worthy motives, I hope their principal object is to qualify themſelves the better for the ſervice of their king and country, in thoſe public employments which at their return they ſollicit, and to which they have ſome claim Now if this be their object, it is more neceſſary for them to viſit Norway and Sweden, than all the other countries of Europe An acquaintance with the latter (Sweden) both in reſpect to its ſtrength and its weakneſs, is unqueſtionably more neceſſary to our young ſtateſmen, than to be able to decide which merits the preference, the Rheniſh, Italian, French, or Spaniſh wines As to the neceſſity of an accurate knowlege of Norway, I believe it muſt be immediately manifeſt, if not to others, at leaſt, to a Norwegian, when he ſees a perſon filling ſome eminent poſt either in the ſtate, or in the law, with irreproachable integrity, who is totally ignorant of the particular circumſtances and properties of Norway, and wherein they totally differ from thoſe of Denmark Thus the public, contrary to his intentions, may ſuffer great detriment, or many things be neglected, which would be happily executed, if his public ſpirited views were directed by his own diſcernment, which would enable him without ſeeing thro' the eyes of other men, throughly to ſift and examine the grounds and conſequences of a matter, which now becomes doubly difficult, it being not only foreign to him, but very remote perhaps from the purpoſe, to which he is meditating to apply it

In this reſpect, I flatter myſelf, this firſt eſſay towards a natural hiſtory of Norway, will have its uſe with ſome, who never had an opportunity of perſonally viſiting a country, with which, by virtue of their office, they are in a greater or leſs degree, perpetually concerned

This work, moreover, with all its imperfections, may ſerve to enrich natural hiſtory in general with ſome particulars, of which, conſummate naturaliſts were heretofore the only competent judges I am very far from deſiring to relate, or eſtabliſh marvel-

lous

lous things, merely to excite the admiration of the reader. On the contrary, I have endeavoured to rectify the erroneous idea which many, even among the learned, have, for want of better information, formed of ſeveral, in themſelves very wonderful natural phænomena, here in Norway; ſuch as a bottomleſs ſea-abyſs growing in the Moſkoe-ſtrom, penetrating quite thro' the globe, of ducks growing on trees; of a water on Sundmoer, which in a ſhort time turns wood into ſtone, and many other ſuch things, which, ſome who have had no opportunity of enquiring further, or others who were not diſpoſed to it, have received as undoubted facts. The reader will meet with many ſtrange, ſingular, and unexpected things here, but all of them ſtrictly true, ſome of them not diſcovered before, others confirmed, and, to the beſt of my ability, in ſome meaſure accounted for, and illuſtrated.

Perhaps, Norwegians by birth, to whom the nature of their country is better known, may, from their own particular experience in divers parts, produce ſomething more complete and extenſive. If they ſhould be animated thereto by this work of mine, I ſhall account it among the accidental advantages which may reſult from it, and in this caſe, let no one imagine that a difference of opinion, decently delivered, will give me any offence, or trouble, the diſcovery of truth, is in this and every other reſpect, my chief end, and I live in an age, which not content with mere hypotheſes, unſupported by proofs, requires that every fact or poſition, which is advanced as real, be at leaſt demonſtrated poſſible, and conſonant to the nature of the things in queſtion.

Phyſics, having never been my chief ſtudy*, I am far from the *arrogance of ſuppoſing*, that I have always hit upon the true original cauſe, and laid open the connexion of every ſubject, and I am much farther from the preſumptuous conceit, that I have, in

* Si mihi homini vehementer occupato ſtomachum moveritis, triduo me jurisconſultum profitebor. Cicero in Orat. pro Murena, cap. xxviii.

every particular, developed the abſtruſe meaſures, and diſcovered the ſecret deſigns of the infinite Creator, whoſe ways are paſt finding out. I hold with Bartholin "Officio ſuo ſatisfecit phyſicus, ubi rationes adduxit probabiles" It is not in one reſpect only that our Saviour's words hold good, *the wind bloweth where it liſteth, and thou hearеſt the ſound thereof, but thou knoweſt not from whence it cometh nor whither it goeth* And the wiſe man does not exaggerate when he ſays, *we ſcarce perceive what lies upon the earth, or feel what is betwixt our hands* However, our almighty and all-wiſe Creator cannot be diſpleaſed at an inveſtigation of his works, with a pious and reſpectful docility, nor at the praiſes we give to his holy name for ſo much as falls within the extent of our faculties, reſting aſſured, that what is beyond our reach in this ſtate of probation, will be explained to us in that new heaven and new earth which we look for according to his promiſe

I ſhall now, purſuant to my promiſe, give ſome account of the ſources from whence I have drawn what is here offered to the public. Theſe are partly writings relating to Norway, partly my own certain experience, as far as it extended, and partly the obſervations of ſome intelligent perſons, communicated to me at my deſire

In the firſt claſs are our noted hiſtorians and chorographers, eſpecially Peter Nicholas Undalin, formerly ſuperintendant over the diſtrict of Liſter, miniſter of Undal, in the dioceſe of Chriſtianſand, and a canon of the chapter of Stavenger, who, beſides his tranſlation of Snorre Sturleſon's annals, from the old Norwegian tongue into modern Daniſh, wrote a poſthumous work, publiſhed at Copenhagen, in quarto, in the year 1632, intitled, A True Deſcription of Norway and the adjacent Iſlands. Of this piece Dr Chriſtopher Stenkuhl, in 1685, publiſhed a German tranſlation with additions It gives a tolerable account of the extent of every province in general, its ſubdiviſion, and the names of the diſtricts and pariſhes, with ſome particulars on the nature and

qualities of the ſoil, but theſe are but few in number, it not having been his deſign to treat expreſsly of them Mr. Jonas Ramus, heretofore paſtor to the community of Norderhong in Rongerige, in the dioceſe of Aggerhuus, goes further This writer, beſides many other theological and hiſtorical compoſitions, has deſerved highly of his country for his Deſcription of Norway, publiſhed in quarto, at Copenhagen 1715 It is a chorographical improvement upon Undalinus's work, but having the ſame point in view with that author, he confines himſelf within the ſame limits, yet is fuller on the nature and products of the country, adding, particularly at the cloſe, from page 240 to 274, an appendix, enumerating the ſeveral beaſts, inſects, birds, fiſhes, herbs and trees. This conſiſts indeed of little more than the bare names of them, but was of uſe however to me, as it opened a large field for further enquiry Arendt Berendſen's Fertility of Denmark and Norway, printed in quarto at Copenhagen, in 1656, is a book which exhibits a clear account of the different fertility of the reſpective provinces, and ſeveral particulars concerning the products of the country, but this again proceeds no farther than giving the names of things *. In ſome certain points, I have been moſt indebted to Mr Lucas Debes's Feroa Reſerata, or Deſcription of the Ferro Iſlands, publiſhed at Copenhagen, in octavo, 1673. This gentleman, who was formerly ſuperintendent of Ferro, was, for the times he lived in, and the opportunities he had, a good naturaliſt, and, as the iſlands he deſcribes, lying parallel to the weſtern coaſts of Norway, have ſome analogy with them, eſpecially on account of the ſea-fiſh and water-fowls, his obſervations were of greater aſſiſtance to me than any other work I have likewiſe gleaned ſome good materials from diſtinct treatiſes on ſingle ſubjects, ſuch as Wormius's Tractatus de mure Norvegico, Dethardingii Diſſ de vermibus in Norvegia qui novi viſi, Gartner's Hor-

* The Norrigra Illuſtrata of Jens Lauridſen Wolf, hardly deſerves to be ranked among the chorographies of the country, it containing little of any importance but what is hiſtorical

ticultura Norvegica, Lochstor's Diss. de Medicamentis Norvegiæ sufficientibus, Dasse's Description of Nordland, &c.

The loss of the manuscript history of the beasts of Norway, by the above-mentioned Mr Peter Nicholas Undal, is exceedingly to be lamented; it happened in this manner. The author had transmitted his work to his intimate friend Dr. Worm, that before it was committed to the press, it might undergo the revisal of that consummate naturalist †. With him it remained till his death, when it fell into the hands of Dr Thomas Bartholin, who carried it to his seat at Hagested in Silland, where, together with many other valuable books and manuscripts, it was unfortunately burnt. Undal, page 83 of his Chorography, mentions another book, called Speculum Regale, to which he appeals for what is said concerning a hazle stick being petrified in Birkedal morass, in Sundmoer, from whence I conclude, this book must have turned upon natural history; but as probably it was likewise a manuscript, it was a great pity that the public was not benefited by it, before it was lost, as is unquestionably the case. But a greater calamity to the literary world, was the conflagration which happened 1734, in the city of Christiansand, which destroyed that invaluable assortment of collections for a natural history of Norway, in which Mr Jens Spidberg, an ecclesiastic of great eminence there, had with indefatigable application spent many years. He was a man consummately accomplished for so great an undertaking, as appears from the other monuments extant of his genius, which display a singular penetration and judgment, with an infinite compass of learning, especially in physics and mathematics. I shall here quote a passage from a letter, with which he favoured me, dated Dec. 10, 1750, concerning his design, which he relinquished after the unfortunate loss of his manuscripts and library. I should not have troubled the reader

† This, however, from the following mention made of it, by the said Mr Worm, does not appear to have been a comprehensive or finished work. Petri Undalini fragmenta historiæ animalium Norv. MSS. quæ penes me sunt. Tr. de Mure Norveg. page 3.

with

with this extract, but it contains ſome things relative to my preſent purpoſe.

"It is to be lamented that hitherto no perſon has ventured to undertake a natural hiſtory of Norway, for I am perſuaded that no country in the univerſe affords more curioſities and wonders, out of the three kingdoms, of nature, than this; and conſequently, there is not a ſubject more fit for the pen of a naturaliſt. Had M. Maupertius gone as far as to Wardehuus, or to the north-cape, and there made his diſpoſitions for taking the figure of the earth, his calculations would have been attended with leſs difficulty, and more certitude than at Tornea Had M de Mairan taken care to procure from Norway, ſome accurate obſervations on the Aurora Borealis, his valuable Traité Phyſique de l'Aurore Boreale, had been much more complete and deciſive, for the north light takes its riſe from Norway, and particularly from the dioceſe of Drontheim Conſiderable additions might have been made to Redi, Swammerdam, and even to M Reaumur's Memoires des inſectes, had they had the advantage of a communicative, and obſerving correſpondent in Norway, where are ſeveral tribes unknown either in Italy, Holland, or France. Linnæus, by his obſervations in Sweden, has enriched botany more than Tournefort, by all the remarks he made in France, or in his travels to the Levant. I need only mention the article of metallurgy, in which Norway ſurpaſſes all other countries, producing all kinds of minerals and metals, from gold, to ſulphur and lead In like manner I paſs over the numberleſs beaſts, birds, and fiſhes peculiar to Norway; the rivers, hot ſprings, meteors, and the ſeveral alterations of the air, &c but alas! all theſe things, ſuch is the incogitancy and ignorance of the people, are ſtill almoſt unknown, at leaſt, I have not yet heard of any one equal to the taſk, who has attempted to place them in a proper light. Peter Nicholas Undal, to whom we owe a tranſlation of Snoire Sturleſeus, and a civil hiſtory of Norway, had, it ſeems, alſo compoſed a natural hiſtory, but it being ſent to Copenhagen for approbation, was ſuppreſſed,

or

or at leaſt not publiſhed, though a phyſical treatiſe written 130 years ago, would little ſute the taſte of theſe more enlightened times The great Wormius in his Muſæum, and Tho. Bartholin in his acta medica, and hiſtorica anatom rariora, have, I know, introduced ſome of the curioſities of Norway, but their accounts are defective Jonas Ramus was diſtinguiſhed by a knowlege of the hiſtory and antiquities of his country, but was not eminent as a naturaliſt About five or ſix years ago, Count Reuſs, who was then governor here, ordered all the litterati in theſe parts to ſend in an account of every particular in their reſpective countries which might contribute to the melioration of the ſoil, or the improvement of agriculture Some ſuch memorials were delivered in, but of what uſe they were, or whether any meaſures were taken in conſequence of them, I have not heard It may be preſumed that the like orders were iſſued in the other dioceſes Mathematics, and natural philoſophy have always been my favourite ſtudies, and in my late library I was poſſeſſed of moſt and the beſt phyſical writings publiſhed in Italy, France, Germany, and England. It was Scheuchzer's Natural Hiſtory of Switzerland, that firſt induced me to undertake a work of the ſame kind on Norway; and I had an opportunity of perſonally making the beſt collections and obſervations for that purpoſe, being ordered by baron Lowendahl, who commanded in chief in Norway during the laſt war, to draw a map of the country, and frontiers betwixt Norway and Sweden, a copy of which, I am informed, is in the Collegium Curioſum at Copenhagen This undertaking gave me an opportunity of travelling thro' the dioceſe of Chriſtianſand, and of obſerving all the rivers, lakes, mountains, and every thing relative to natural hiſtory, but afterwards, whilſt I was employing my leiſure in augmenting and digeſting my collections, in order for publication, that deplorable fire which happened in Chriſtianſand 1734, deprived me, beſides 6000 volumes in all languages and ſcience, of all my collections and manuſcripts, ſo that my whole ſtock was reduced to what I had treaſured up in my memory,

mory, and I have ſince acquired by ſubſequent obſervations. I had before publiſhed two little pieces, one in Holland, de cauſa et origine ventorum, the other at Hall in Saxony, of the North-light. I can ſtill amuſe myſelf, with the entertainment I receive in my leiſure hours, from books of Mathematics, and natural philoſopy" So far M Spidberg.

It is therefore a melancholy conſideration, that ſo few having made any advances towards a natural hiſtory of Norway, their collections ſhould be thus deſtroyed, which, from ſeveral cauſes, has been the fate of many excellent writings among us Concerning the neglect of natural hiſtory, or the great ſcarcity of ſuch writings in the northern countries, the learned Muller, in his Iſagoge ad Hiſt Cherſoneſ Ambricæ, cap xi p 10 thus expreſſes himſelf "Hiſtoriæ chorographicæ cognata eſt naturalis, quæ licet infinita rerum αξιοθαυμαστων varietate in regionibus hiſce luxuriet, et curioſorum calamos atque ingenia provocet, pauci tamen hactenus partem illius aliquam illuſtrandam ſibi ſumpſerunt" This likewiſe is the complaint of Dr Henry Lochſtor, whoſe death in the maturity of life, and in the midſt of many uſeful deſigns, was a public loſs, in his diſſertation De Medicamentis Norvegiæ ſufficientibus, p. 20, he ſays, "Monendum duxi, haud deeſſe Norvegiæ fontes medicatos, deeſſe autem, qui horum vires et principia inquirant ſolertes naturalium rerum ſtudioſos" If we conſider the natural cauſe of this, it will not appear matter of complaint, tho' the effect is ſo in a great degree In a country ſo healthy as Norway, a few phyſicians will ſuffice, and conſequently, there are few who devote themſelves to phyſical reſearches.

From theſe ſeveral circumſtances it will be eaſy to conclude, that I had not a multiplicity of ſources from whence to draw many choice materials. The diſcoveries which I have been able myſelf to make, either by my own experience, or enquiries, or experiments, have furniſhed my principal aids. My annual viſitations, as has been intimated before, gave me the beſt opportu-

nities, and great encouragement Almoſt every inn in this extenſive dioceſe, gratified my curioſity, and yet this is not the only province known to me from my own experience. The dioceſe of Drontheim is the only one I have never been in, the others I have travelled through, and in ſeveral places in that of Aggerhuus made ſome ſtay, and always took care to find out a perſon, who was able to ſatisfy me in any queſtions concerning the nature and circumſtances of the country But the dioceſe of Bergen, as will be eaſily imagined, is the country of which I have had the moſt perfect knowlege, both from experience and information Theſe circuits uſually take up two or three months, and leaving me more vacant time than I could wiſh, I uſually, according to the proverb, make a virtue of neceſſity, by ſpending part of the time in converſation with the guides and drivers, appointed at different ſtations to attend upon me with carriages Their anſwers to my ſeveral queſtions, I afterwards examine with the miniſters of the pariſhes, or ſome other perſon well acquainted with the country, and whatever I hear confirmed by ſeveral teſtimonies, or not controverted, or doubted of, I enter among my miſcellaneous obſervations, and, at my return home, compare them with the deſcriptions of ſuch countries, eſpecially the mountainous, or which are in any other reſpect analogous to Norway. Theſe annual tours I have alſo improved towards making a ſmall collection of naturalia of Norway, ſuch as ſtones, ores, foſſils, ſea-trees, corals, ſnails, muſcles, uncommon birds, fiſhes, and the like, of the moſt remarkable of which, for the gratification of the reader, I have cauſed prints to be annexed

Laſtly, on the ſubject of the Norway-birds, and more particularly the fiſh, I have had recourſe to the obſervations of men whoſe dwellings and employments give them opportunities of examining more minutely things, which do but ſeldom fall under general obſervation As to fiſh and marine-animals, a greater variety, and ſtranger tribes are ſeen hereabouts, and off Nordland, than in any part of Europe, but a ſuperſtition which prevails among

among the lower claſs of people, deprives us of moſt of theſe, for, when they happen to catch a fiſh of a ſtrange, ſingular figure, conſequently the greater ſubject of curioſity, they are ſure immediately to throw it over-board, to thoſe of the monſtrous ſpecies the peaſants give the general appellation of trold, devil, or trold-fiſh, devil-fiſh, and are weak enough to imagine, that unleſs it be immediately ſet at liberty, their fiſhing will be unſucceſsful, and ſomething or other amiſs will certainly befall them.

I have now, delivered what I principally intended in this preface, I ſhall only repeat the before-mentioned declaration, that I do not ſend this eſſay abroad as a maſter-piece, and ſhall rejoice to ſee it improved by more intereſting articles, and more refined obſervations; and to ſee a complete ſuperſtructure raiſed on this foundation, by perſons of more leiſure and opportunity.

However, I own myſelf entirely in the ſentiments of a very eminent writer on the like occaſion, who, in his firſt eſſay of a natural hiſtory of Hungary, aſſerts the claim of an original writer to the indulgence of the public, in the following words; "Res omnino remotas è ſua, ut ita dicam, barbarie primus exemi; propterea veniam meren videor mihi, ſi nec omnia eruerim, nec omnia correctè ſentio meſſe multa quæ corrigi, deeſſe quæ valeant ſuppleri *" Had I not judged this work to ſtand in need, or to admit of any amendment, I ſhould not ſo frequently have called it an eſſay in this preface; but it is, indeed, the firſt eſſay on this ſubject, and of courſe encumbered with difficulties too great for the application and talents of one man; and on this ground, I hope that every candid judge, who knows how little leiſure my indiſpenſible functions leave me, will not require more, or a more perfect work of this kind from one, who may appear to have performed more than could be expected, who has denied himſelf many hours of natural repoſe, if not ſuffered

* Aloyſius Comes Marſilli in Danub Panon Myſic Tom 1 Præfat

by

by his aſſiduity in other reſpects *, but this I ſhall never regret, if, in any meaſure, I can contribute to promote the glory of God, and the public welfare.

Bergen, May 1. 1751

* Qui multa agit, ſæpe fortunæ poteſtatem ſui facit, quam tutiſſimum eſt rarò experiri Seneca de Tranquillit Anim Cap XIII

A LIST *of the* AUTHORS *quoted in this Work.*

A.

ABILGAURD Petr.
Acta Medica Hafnienſ
Acta Societ. Reg Hafn.
Acta Uratislaw
Ælian
Aldrovandus Ulyſſes.
Anderſon John
Arbuthnot John
Ariſtotle
Arreboe Andr
Athenæus.

B

BANG Oluf
Bartholin Thomas
Bellonius
Berndſen Arndt.
Bertius
Bibliotheque Britannique
Bibliotheque Germanique
Bibliotheque Raiſonnee,
Bibliotheque Philoſophique
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Boyle Robert
Bonnet Charles
Borner Nicol
Borrichius Olaus
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Brommel Magnus
Brown Sir Thomas
Buchanan
Buchwald John
Buffon M
Burnet Thomas
Buſſæus Andr
Buxbaum Jo Chriſt

C

CAMBRENSIS Giraldus
Camerarius Elias
Carteſius Renat
Careri Gemell
Chardin M
Charlevoix Pere
Cicero
Cleffel Joh
Clercle Joh.
Cluſius
Cnoxen Jac
Commentarii Academ Petropol.
Condamike M
Cragius Nicol
Crantzius Albert

D

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Dalin Olaus
Dampier
Dapper Odoard
Daſs Petr
Daubenton M
Debes Lucas
Delices de la Suiſſe Anon
Derham William
Deſaguliers
Detharding Georg
Diodorous Siculus
Dolmer Jens
Duvernoi

E

EGEDE Joh

F

FEUSTKING Henr
Flemming Hans
Frantzius

G

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Geſner Conr
Glyſing Joh
Gram Joh
Grammaticus Saxo
Griſhn Hugues
Grotius

Scheid

THE

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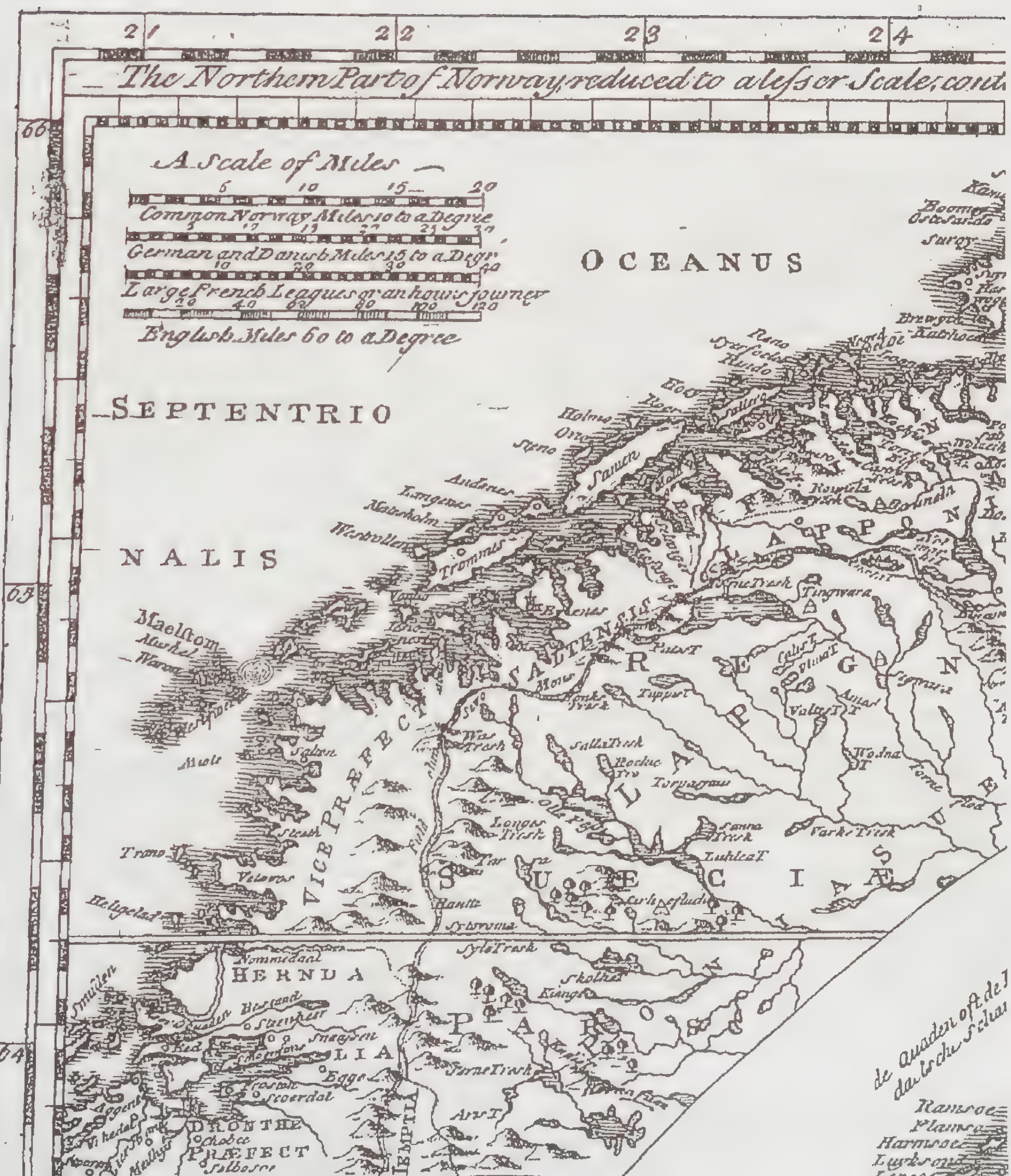
The Northern Part of Norway, reduced to a lessor Scale, cont
A Scale of Miles
Common Norway Miles 10 to a Degree
German and Danish Miles 15 to a Degr.
Large French Leagues or an hours journey
English Miles 60 to a Degree
OCEANUS
SEPTENTRIO
NALIS
Maelstom
VICE PRÆFECT
HERNDA
Tingwara
Salten
Trommes
Hantu
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Opdael
Sundael
SUNDAEL
OPDAL
Rud Field
Hamerswag
Roemsdael oft Yffiord
Romsdalen


NORVEGIA
LAPPO
NIA
HERNS
SUE
DALIA
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DAAL
Sule Field
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Olde I
Klippen
Helmara
Sillewoon
Hufsond
Mussund
Grotale Floord
Fieldfoggenosh
Seogges wag
Kruys Floord
Kape Floord
Roothelm
Salmar Floord
Fndanfs

Hierkin
Toom
Quani
Voer
Ardal
Lill: Hamer
Hadeland
Ringerike
Ringe
Kongsberg
Tingsdahl
CHRISTIANIA
Anslo
Opslo

∘ Villages
‡ Archbishops see
+ Bishops see
N B The Kingdom of Norway is subject to the King of Denmark but the Government of Bahus was Yielded to the Swedes by the Treaty of Roschild in 1658, as was also a part of Drontheim called Herndal by the Treaty of Copenhagen in 1660.
East
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62
61
D A L E C A R L I A
Idra
Herdala
Serma
Transtrom
Ostersia
Lyma
Tolmenskhow Silva
Apelborda
Borga
Rommendal
Osterdalen
Dalhu

A accurate MAP
of the
KINGDOM of NORWAY,
containing 5 general Governm.
or Dioceſes, Viz.
Aggerhuys Bergen
Drontheim, Wardhuys,
and Bahus.

By John Baptist Homman,
Corrected by Martin Hubner,
Professor of History at the
University at Copenhagen.

CHRISTIANIA
Aggerhus Slot
SALTSBERG
Kongberg
Hekle Field
Bugle Field
Nordsoe Vand
FREDRIKSTAT
Tousberg
O C E A N U S
S E P T E N T R I O N A L I S
A Scale of Miles
English Miles 60 to a Degree
Common Norway Miles 10 to a Degree
German and Danish Miles 15 to a Degree
Large French Leagues or an hours journey
South

Berga
Dalbu
Eda
Koln
V E R M E L A N
Helmedal
Sillerod
Glava
Rogel
Ed
Wener
Aleruend
BAHUS
Paternoster
Marstrand
GOTTENBORG
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THE NATURAL HISTORY OF NORWAY.

PART I.

CHAPTER I.

Of the Air and its Phenomena

SECT I.

The climate and various atmoſphere of Norway

THE air, together with the light, warmth, humidity, and other properties thereof, varies much more in Norway than in moſt European countries This may well be concluded, without perſonal experience, from the vaſt extent of the country, of 300 Norway-miles * from cape Lindeſnaes ſouth,

* The common miles of Norway are computed to be about one fourth larger than a German mile, at which rate they are near equal to five or ſix meaſured Engliſh miles

to the north cape on the borders of Ruſſia Thus M. Ramus, ſo juſtly celebrated for his hiſtory of the civil tranſactions and antiquities of his country, in the Chorographical deſcription of Norway, computes its length from Lindeſnaes in the dioceſe of Chriſtianſand, which lies in 58, or, more preciſely, in 57 degrees, 47 minutes latitude, to the north cape at the extremity of Finmark, at 71 degrees and half, to be in a direct line, or through the air, 202 miles and a half, but he finds that the circuit acroſs the mountains and vallies, or by water, from one cape to the other, increaſes it to above 300 miles, and its breadth from the frontiers of Sweden weſtward, to cape Statt near Sundmoer, in 21 degrees of longitude from the Canaries, is 65 miles, but from thence, the country becomes gradually narrower towards the north. I have no particular knowlege of that part of Norway called Finmark, which lies in the frigid zone, or near the polar circle. It is the country of Norway, properly ſo called, at the extremity of the temperate zone, that is here to be chiefly treated of, and it is the air of this country, which I affirm to vary conſiderably in reſpect of the degrees of heat and cold, light and darkneſs.

SECT. II.

Day light and length of the day

In this and moſt other points, I ſhall chiefly regulate my obſervations by the horizon of Bergen, not only as it happens to be the place of my reſidence, but as its latitude, being 61 degrees 15 minutes, with reſpect to north and ſouth, lies nearly in the middle of Norway * properly ſo called. The longeſt day at Bergen conſiſts of 19 hours, the ſun riſing at half an hour paſt two, and ſetting at half an hour after nine, and the ſhorteſt is only ſix, the Sun not riſing before nine, and ſetting at three

The gradations of the increaſe and decreaſe of day-light, are clearly exhibited in the following table

* At Bergen in Norway, Gefle in Sweden, Nyſtad in Finland, and Wyburg in Carelia, as being at parallel diſtances from the equator, the days and nights are of the ſame length But at Bergen it is noon at the very ſame inſtant, as at Utrecht in Holland, Marſeilles in France, and Conſtantine in Africa

The

The riſing and ſetting of the Sun in the horizon of Bergen, in the 61ſt degree of latitude, according to Pontanus.

January			February			March			April		
	Sun riſes	Sun ſets		Sun riſes	Sun ſets		Sun riſes	Sun ſets		Sun riſes	Sun ſets
1	8 ¼	3 ¼	4	7 ½	4 ¼	2	6 ½	5 ¾	5	4 ¾	7 ¾
11	8 ½	3 ½	10	7 ¾	4 ¾	6	6 ¼	5 ¾	11	4 ½	7 ¾
20	8 ¾	3 ¾	14	7	5	11	6	6	16	4 ¼	7 ¼
25	8	4	19	6 ¾	5 ¼	16	5 ¾	6 ¼	21	4	8
30	7 ¾	4 ¼				21	5 ½	6 ½	26	3 ¾	8 ¼
						26	5 ¼	6 ¾			
						31	5	7			

May			June			July			August		
	Sun riſes	Sun ſets		Sun riſes	Sun ſets		Sun riſes	Sun ſets		Sun riſes	Sun ſets
1	3 ¼	8 ¼	2	2 ¼	9 ¼	4	2 ¾	9 ¼	4	4 ¼	7 ¾
7	3 ½	8 ¾	7	2 ½	9 ½	9	3	9	6	4 ½	7 ½
12	3	9	13	2 ¼	9 ¼	14	3 ¼	8 ¾	14	4 ¾	7 ¼
22	2 ¾	9 ¼	18	2 ¼	9 ¼	19	3 ¼	8 ½	19	5	7
28	2 ½	9 ½	23	2 ¾	9 ¼	24	3 ¾	8 ¼	25	5 ¼	6 ¼
						29	4	8	31	5 ½	6 ½

September			October			November			December		
	Sun riſes	Sun ſets		Sun riſes	Sun ſets		Sun riſes	Sun ſets		Sun riſes	Sun ſets
4	5 ¾	6 ¼	4	6 ¾	5 ¼	5	8 ¾	3 ¼	6	9 ¼	2 ¾
14	6	6	9	7	5	11	8 ½	3 ½	12	9 ½	2 ¾
19	6 ¼	5 ¾	14	7 ¼	4 ¾	17	8 ¾	3 ¾	17	9 ¼	2 ¾
24	6 ½	5 ½	20	7 ½	4 ½	28	9	3	22	9	3
			25	7 ¾	4 ¼						
			31	8	4						

A particular herein obſervable, is, that as in the beginning of the year the day-light increaſes with remarkable celerity, ſo it decreaſes at the approach of winter in a like proportion In the middle of February, I have been able to read without difficulty at ſix in the morning, which at the ſame hour in October was not poſſible; the cauſe of this, being manifeſtly the inclination of the earth towards the poles, needs no further explanation

Clearneſs of the ſummer nights

In the ſummer nights the horizon, when unclouded, is ſo clear and luminous, that at midnight one may read, write, and do every kind of work as in the day, this I have often experienced, even when age had brought me to the uſe of ſpectacles Chriſtian V during his ſtay at Drontheim, in June, 1685, uſed to ſup at midnight, without the uſe of lights In the diſtrict of Tromſen, which is properly the extremity of Norway, towards the iſlands of Finmark, the ſun is continually in view in the midſt of ſummer, and is obſerved to circulate day and night round the north pole, contracting its orbit, and then gradually enlarging it, till at length

it

it leaves the horizon, ſo that in the depth of winter it is inviſible for ſome weeks *, and all the light perceived at noon is a faint glimmering of about an hour and half's continuance, which, as the ſun never appears above the horizon, chiefly proceeds from the reflection of the rays on the higheſt mountains, the ſummits of which are ſeen more clearly than other objects However, this glimmering is not the only light with which the inhabitants of theſe northern provinces are provided for their fiſheries, and other employments, in the open air The wiſe and bountiful creator hath afforded them all poſſible aſſiſtance, for theſe and other purpoſes Beſides the moon-ſhine, which by reflection from the mountains, is exceedingly bright in the valleys and creeks, theſe northern people, as well as the peaſants, and fiſhermen in the dioceſe of Bergen, when their day-light is contracted to ſix hours, find conſiderable relief from the north-light called Aurora borealis, it often affording them all the light neceſſary to their ordinary labors, eſpecially as it is now both here and elſewhere more frequent and extenſive than formerly

SECT. III.

The *Aurora borealis* and ſea light in the night

This light in the air †, which here, and in Sweden, is known by the name of Værhos, Lyſnar, Lyſanigar, and Lottetſkien, is elſewhere generally called the north-light, as uſually iſſuing from the north, and its appearance moſtly known to the northern people, although the real cauſe of it be here, no leſs than in other parts, a very dark problem, and involved in many uncertainties I ſhall the leſs preſume to advance any thing as certain and deciſive on this head, ſince counſellor Ramus, a native of Norway, and a celebrated mathematician, hath not ventured to

* Even in thoſe provinces, where, I have already obſerved the ſhorteſt day to conſiſt of ſix hours, there are alſo ſome few parts ſo incloſed within the ſteep mountains, that for ſeveral months they cannot ſee the ſun's diſk, though its beams are viſible to them As I paſſed in my viſitation through the iſland of Lærdahl, the maſter of the houſe where I lodged, *aſſured me*, that he, *and his next neighbours were bleſſed with* the ſun's appearance, not more than four months of the whole year, namely, from the middle of April, to the middle of Auguſt, yet others, at the diſtance of but a quarter of a mile, where the valley widens, could ſee it as uſual This muſt be the condition of ſome of the inhabitants of the Alps, eſpecially about Monte Cenis, which ſeparates Savoy from Piedmont, where, in ſome valleys, though the ſun does not appear during the whole winter, yet the inhabitants enjoy the neceſſary day light

† In England, and eſpecially in the north parts, where the north light is alſo well known, it is by reaſon of its deſultory motion, called Morrice dancers, Merry dancers, and ſtreamers

account for it, and nothing of this kind is found even in the Acta Societatis Hafniensis, T I N° IX and T III N° VI. where it might most naturally be expected, as these pieces contain historical and physical accounts of this very light, with several plates, representing the observations made in many parts of Europe, on the various figures of the northern lights In the year 1741, the son of Capt. Heitman, another great naturalist of Norway, published a posthumous piece of his father's, on the heat of the sun, &c. and likewise on the north-light His system of the means and manner by which the sun influences our earth, and the other planets, at such an immense distance, through the æthereal expanse, is certainly very ingenious, but I am cautious of subscribing to it, as it opposes the doctrines of Newton, Wolfius, Reimbeck, and other eminent mathematicians; yet his thoughts on the north-light, as he was both a person of great erudition and experience in philosophy, deserve to be here inserted along with other conjectures, especially as he there treats of another phænomenon analogous to it, namely, a sea-light, or a luminous appearance in the water, called by the Norwegians, Moor-Ild His sentiments on both these subjects are as follows "Thus it is observed in the frigid zone, that the force which gives motion to the high winds, is there at its utmost height, insomuch, that sometimes the lower region of the air, which is filled with nitrous vapours, is whirled round, and then is formed that light in the air called the Aurora borealis, or north-light yet this is a light void of heat, and of the same nature with that light which the people of Norway call Moor-Ild, and takes its rise nearly from the same cause as the Moor-Ild, the latter proceeding from an agitation of the salt-water in a dark night, which hath been every year observed by the herring-fishermen, when towing their nets along in a calm, for the sea appears in a kind of flame, as far as the nets reach, whereas before the motion of the nets, not the least glimpse of light was discernible In fresh-water lakes, there is no such flame apparent, it being formed by the saline particles, which upon a motion of the sea begin to sparkle, and cause an effulgence * The same has been likewise observed in

* This sparkling fire in the sea, shall be treated of more at large in chap 3 sect 8 when we come to treat of the sea, to which it properly relates

navigation for as in a dark, calm night, the courſe of a fiſh is perceivable by a long and increaſing track of light upon the water, ſo the water, behind a ſhip under ſail, appears luminous to a conſiderable diſtance

It is not at all times, however, that this igneous effulgence is to be ſeen in the ſea, but it frequently happens at an approaching alteration of the weather, and on the change of the winds to ſouth-weſt, when the ſaline particles of the ſea are thrown into a kind of fermentation In like manner, the northern-lights do not always appear, but only at particular ſeaſons, when the ſaline corpuſcles of the air are agitated by a natural fermentation. But the proper rationale of this fermentation, and aſcent of the ſaline particles of the ſea and air, is beſt known to naturaliſts, whoſe reſearches turn on things of this nature However, it is a general obſervation among expert northern navigators, and the fiſhermen who live along the coaſt of Norway, that when the north-light moſtly appears to the weſtward, it is a prognoſtic of a ſouth-weſt wind; which confirms the opinion of the naturaliſts, that ſome regions of the air, as well as of the ſea, abound in ſaline corpuſcles more than others, and theſe, at certain times, create a ferment, and diffuſe a light through the air Although this moſt frequently preſages the above-mentioned change of weather, yet, there is often a conſiderable interval, before the change actually takes place It is however certain, that the cold regions of the air contribute greatly to the change and boiſterouſneſs of the weather, particularly when the north-light has a copper-tinge, a violent ſtorm, at weſt and north-weſt, may be certainly expected, though the weather may for a week after continue favorable to navigators, before the ſtorm comes on Of this I have ſeen many inſtances

In this fermentation of the air the cold is abated, and if it extends ſo far as to rarify the air of the atmoſphere, this is called mild weather And when, by the elevation of the inferior air, it is the more compreſſed againſt that region, which is ſaturated with nitrous exhalations, ſo that the wind in the inferior air ſets the lower part of the cold region in ſome motion, this cauſes thoſe corruſcations in the air, which are called the north-light In thoſe years, when the winter is unuſually ſevere, theſe nor-

thern lights are ſeldom or ever ſeen, the air being too far oppreſſed and condenſed by the intenſneſs of the cold, to force itſelf upwards againſt the nitrous region, and communicate to it that motion which produces the north-light, before the lower air again expands itſelf by freſh fermentations"

Thus far M Heitman, whoſe obſervations in ſome meaſure confirm the general opinion of its being a kind of fulgur brutum, or lightning without thunder, conſiſting, as lightning generally does, of inflamed ſulphureous particles, but burning with much leſs vehemence Dr Nicholas Boerner, in his Phyſics, chap xi p 284 is expreſsly of this opinion, viz "that the north-light is nothing but ſaline, ſulphureous vapours, kindled in the upper air, by a change it undergoes in autumn, ſpring, and at other times, when the ſun has not power ſufficient to rarify and diſperſe theſe ſulphureous particles" Or, to make uſe of the words of the celebrated Wolfius, "it is a ſubſtance as yet immature for lightning; of which he treats in a particular diſſertation, or, an imperfect tempeſt, as he calls it in ſect 335, of his rational Reflections on the works of nature" This opinion may be further corroborated by the following circumſtance. Some perſons of credit, who live in this country, have aſſured me, that theſe Fulgura ſpuria, are not always without a crack or ſound, for in a glaring north-light, and calm weather, a diſtinct ſound has been heard, with an exploſion in the air, like the ſudden breaking of the ice Another opinion concerning the north-light, is, that it is no more than a mere refraction, or reflection of a flame iſſuing from certain vulcanoes, which, in favour of this conjecture, are ſuppoſed to lie beyond Greenland, near the north-pole But this poſition is too weak to build any thing on, or to be generally admitted There are many, however, who conſider the northern lights only as a mere reflection, or reverberation, tho' not from the flame of any vulcanoes, but from the ſun itſelf, when far below our horizon it meets with ſome evaporating clouds, at ſuch a height as to be within the contact of the ſun's beams in their aſcent

This is the opinion, for which Dr Ventſky of Prentſlau declares in his third publication of Miſcellaneous Obſervations, drawn from the celebrated M Euler's enquiry into the north-light,

light, which is to be found in the ſecond part of the Hiſtoire de l' Academie This hypotheſis requires the following concurrence of cauſes, firſt, there muſt be vapours in the upper regions of the air, next, ſome clouds of that ſort, and theſe at a vaſt height, and in the north, and they muſt not only emit vapours, but be illuminated and irradiated by the ſun, when it is inviſible to us, and of conſequence, the ſun muſt be viſible to us at ſuch time, if we ſtood as far above the horizon as the ſaid clouds. And laſtly, there muſt be a north-wind in the ſame upper region of the air to ſet it in motion, and to give a diſpoſition to the figures, which ſo ſuddenly change their appearance It is poſſible, that the experience of poſterity may ſuggeſt ſomething more probable

The author's opinion concerning the north light

If I may be allowed, or expected, to add any opinion of my own on this problematical ſubject, it may perhaps be not more improbable than what hath been already alleged, if we admit, that the original cauſe of the north-light lies in the electricity of the etherial air, and, conſequently, that it has exiſted at all times, and in all places, tho' not viſible to us, without a concurrence of ſuch concurrent circumſtances and junctures, as I ſhall here exhibit It is not above twenty years, ſince the electrical experiments have become generally known, and as they have excited the attention of all lovers of natural knowlege, they have likewiſe filled them with hopes, that this diſcovery would open a way to the ſolution of many more myſteries in nature I flatter myſelf with the ſame expectation, but the firſt experiment of any importance, which has occurred to me, relates to this very point of deducing the north-light from the electrical, feeble, and ſubtile fire of the air, which by means of the more rapid circumvolution of the globe on its poles, or axis, excites a more vehement concuſſion, or agitation, in the air of the northern climates, and thus diſplays the electricity of the ethereal air moſt conſpicuouſly in thoſe parts I was firſt led into theſe reflections ſometime ſince by a converſation with a friend of mine, a very ingenious naturaliſt, who ſhewed me a remarkable paſſage in the Bibliotheque Britannique, Tom XVI P II pag 336 where, among other extracts from the Engliſh Philoſophical Tranſactions, is part of a piece of M Deſaguliers, intitled, A Diſſertation

tion concerning electricity The ſcope of his demonſtrations is ſomething different, viz to ſhew the true cauſe of the aſcent of rain-water, and the power by which it remains floating in the air, which is at all times much lighter than water But as the inveſtigation of one truth often proves introductory to another, ſo in this paſſage the writer ſeems to direct us to a clearer inſight into the origin and nature of the north-light I ſhall therefore inſert ſo much of that paſſage here, as relates to our purpoſe In order to apprehend his meaning, we muſt recollect with the learned writer, that Mr Du Fay's obſervation, "that there are two ſorts of electricity," is proved by obſervations and experiments, and that the electrical bodies of a vitreous electricity mutually repel one another, whilſt they attract thoſe of a reſinous electricity, alſo that thoſe of a reſinous electricity repel one another, and attract thoſe of a vitreous electricity

"I ſuppoſe, ſays Dr Deſaguliers, particles of pure air to be electric bodies always in a ſtate of electricity, and that vitreous electricity.

1ſt, Becauſe particles of air repel one another without touching, as has been deduced from experiments and obſervations

2dly, Becauſe when the air is dry, the glaſs-tube rubb'd (or only warmed) throws out its effluvia, which the air drives back to the tube, from whence they dart out anew, and ſo move backwards and forwards with a vibratory motion, which continues their electricity

3dly, Becauſe the feather made electric by the tube, and darted from it, keeps its electricity a long time in dry air, whereas when the air is moiſt, the moiſt particles, which are non-electrics, floating in the air, and being attracted by the feather, adhere to it, and ſoon make it loſe its electricity, which alſo happens even to the tube in a little time

From this conſideration it will be eaſy to account for a famous experiment of the late Mr Hauksbee, which is this

Having pump'd out all the air from a glaſs-globe, he caus'd it to turn on its axis very ſwiftly by means of a rope with a wheel and pulley, then rubbing the glaſs with his hand during its motion, there appear'd a great deal of light of a purple colour within the globe, without any light or attraction obſerv'd on the outſide of the glaſs, which is obſerv'd when the air has not been pump'd

out Then turning the cock ſo as to re-admit the air gently into the globe during its motion, the light was broken and interrupted, diminiſhing gradually, till at laſt it appeared only on the outſide of the glaſs, where it was accompanied with attraction Does it not appear that the external air, by its electricity, at firſt drives back the electric effluvia of the glaſs, which go then to the inſide of the globe, where there is the leaſt reſiſtance? For we obſerve that as the air comes in, it repels the electric effluvia, that go inwards no longer when all the air is come in If the fact be ſo, as the experiment ſhews, is not my conjecture proved, viz that the air is electrical?

In the reverend and learned Dr Hales's Vegetable Statics, ſeveral of his experiments ſhew, that air is abſorbed, and loſes its elaſticity by the mixture of ſulphureous vapours, ſo that four quarts of air in a glaſs-veſſel will, by the mixture of thoſe effluvia, be reduced to three Will not this phænomenon be explained by the different electricity of ſulphur and air? The effluvia of ſulphur, being electric, repel one another and the particles of air, being alſo electric, do likewiſe repel each other But the air being in electric of a vitreous electricity, and ſulphur of a reſinous electricity, the particles of air attract thoſe of ſulphur, and the Molecula compounded of them, becoming non-electric, loſe their repulſive force'

The judicious reader may, of himſelf, apply this paſſage to the north-light, and perhaps, by a mature diſcuſſion of it, ſtrike out clearer ideas of that phænomenon than I can develop, who only undertake to ſet down a few things, which have occurred to me

The terreſtrial globe, together with its atmoſphere, may be conſidered as the glaſs-globe of the electrical machine Upon the air being exhauſted, and the globe whirled about with velocity, there appears within it a purple flame, and this is the colour of the north-light, now this flame muſt be the æther igneus Upon the re-admiſſion of the circumambient air, eſpecially if thick and damp, the acid or ethereal fire within is expelled, and hovers for ſome time on the upper ſurface of the glaſs, till, mingling with the air, it is diſſipated, and extinguiſhed Now this ſeems to intimate to us, that the north-light obſerved towards the pole or axis of our earth, does not only owe its origin to the æther, but is the very æther itſelf, which, being aggregated, gives way to

the

the impreſſion of the humid air, and mounts and floats above the clouds, whoſe motion likewiſe renders it variable. Whilſt the air is dry, whether by the froſts of winter, or the heats of ſummer, no north light is to be ſeen. But upon the weather's beginning to break, either by a thaw after a ſharp froſt, or by rains after heat, and when theſe are preceded by damp exhalations, the north-light breaks forth, as a certain prognoſtic of the change. For theſe exhalations have then nearly the ſame effect in the atmoſphere, as the aforementioned intruſion of the air into the glaſs-globe, propelling upwards the lighter æthereal air, when for a time it appears like the purple coloured fluid iſſuing from the glaſs-globe, till it is diſſipated, or mixed again with the ambient air. It is further obſervable, that the air near the poles is far more denſe, and compreſſes more vehemently, as being repelled with leſs violence, than that in the middle of the globe, where the centrifugal power operates with a more direct and immediate force.*

Should this hypotheſis, as indeed I know of no better, be approved by ſuperior naturaliſts, it will afford a very ready ſolution of a difficulty, which clogs all other ſyſtems, namely, It is well known among thoſe people of the north, who have the beſt opportunities of obſerving theſe lights in the air, that the general region of them is not due north, but rather in the north weſt quarter of the ſky. Is it aſked how this comes to paſs? it may be anſwered, that as the ignorant imagine the ſun daily to run from eaſt to weſt, the more intelligent know, that, on the contrary, the earth daily revolves from weſt to eaſt, thereby on one ſide a rarefaction may be cauſed in the air, and on the other a condenſation. It is likewiſe obſervable and conformant to this, that from ſun-ſet to a little paſt midnight, the Aurora borealis is ſtrongeſt, and to the beſt of my knowlege not towards the morning. Let others who have more ſagacity, inveſtigate this matter further.

I muſt aſk the reader's pardon for dwelling ſo long on this particular, though I am not without apology, ſince it appertains

* [illegible] vis centrifuga nihil de gravitate [illegible] tollit, cum [illegible] ſub [illegible] directione perpendiculari [illegible]. Quare etiam pondus atmoſphæræ ſupra [illegible], [illegible] minimum, prope polos maximum, quemadmodum nob[illegible] [illegible] quoque evincunt. [illegible] Muſchenbroek, Element. Phyſ. [illegible]

to the phenomena of Norway, and of the north in general, and these are more immediately my subject, than natural philosophy in general, which, however, I flatter myself, may, in some respects derive some benefit from this work.

I cannot forbear adding, that the northern peasant, tho' he does not arrogantly pretend to inform us, what the Aurora borealis is, yet he is not so stupid as to imagine it to be some tremendous portent of wars, the deaths of princes, and other direful events, which has been the interpretation of those lights, even till modern times, when they have been seen in France, Spain, and Italy, and been made use of to circulate a general terror and anxiety, very seldom as the omen of any happy event. Yet a signal instance of the latter happened even in Norway, and no longer ago than the middle of the last century, which, among other things shews, the north-light formerly not to have been so very usual even here, or not so well known. But one extraordinary circumstance is, that the person who interpreted this light as an omen, was a professor of physics and mathematics, who, in the middle of the last century, was firmly persuaded of having seen an apparition, which probably was no other than the north-light, and this apparition revealed to him the important and happy revolution, which, within three years after happened in this kingdom, when the government was changed into an independent hereditary monarchy.*

* The authority to which I can appeal for this, is in J. H. Leutsing's Gynæceum Hæret. [illegible] p. [illegible] in these words: "A few years since died [illegible] in Kemberg, in his 92d year, our learned and experienced physician Ambrose Knoches, who, while professor of natural philosophy and mathematics, at Christiania in Norway, predicted from the appearances which were observed [illegible] in Norway on the [illegible] of August, 16[illegible] that Frederic III who was then on the throne of Denmark, would be invested with an unlimited sovereignty, and that the kingdom, before elective, would be thus made hereditary. An account of his thoughts [illegible] he drew up in writing at the pressing request of Jens Bilkens, counsellor of the kingdom [illegible] very flourishing, and [illegible] to [illegible] the celebrated C. S. Schurtzfleisch, [illegible] in his [illegible] very well worth reading [illegible] manner: Memorabile est [illegible] Norvegiano, [illegible] Dano Frederico III [illegible] probavit."

SECT IV

The winter mild in the western parts, and the most seldom severe or lasting.

From the light, which is the first object of perception in the air, I proceed to its heat and cold. The degrees of these, as already observed, are very various; and this not only from the annual vicissitudes of the seasons, but in the very same season, and on the same day, the variableness is greater than strangers can well conceive to be possible. I shall the rather enlarge on this remarkable phænomenon, as it is a manifest argument of the power and wisdom of the Creator, and his tender care of his creatures.* On the east-side of Norway, or from the frontiers of Sweden to Filefield, that is in most of the provinces, the winter's cold generally sets in about the middle of October, lasting till the middle of April, or, according to the computation of the peasants, from Calixtus's day to that of Tiburtus, when the air is here as cold as at the extremity of the temperate zone. The waters are frozen to a thick ice, and the mountains and valleys covered with snow. I shall hereafter produce some instances of the extreme intensiness of the cold. However, this is of such importance to the welfare of the country, that, in a mild winter, the peasants, who live among the mountains, are considerable sufferers, for, without this severe frost and snow, they can neither convey the timber they have felled, to the river, nor carry their corn, butter, firs, and other commodities, in their sledges, to market-towns, and after the sale of them, carry back the necessaries they are there supplied with. I must here mention a wonderful instance of the divine œconomy, which I should hesitate to commit to writing, did not thousands of witnesses confirm it: when the

* According to the common opinion, and even the position of Ptolemy's Geography, countries equally distant from, or equally near to, the line, should have equal cold and heat. But that this is not the case is proved by Professor Kastner in his explanation of Dr Halley's method of calculating heat, Hamburg Magazine, tom. iii. p. 426. But none of the instances adduced by him are so clear as what might have been brought from the natural state of Norway, had he been acquainted with it. The true cause of the want of heat, in the northern countries, is the vicinity of that part of the globe to the pole, the solar rays there falling more obliquely and, consequently, not acting with such force as near the line, where they fall in more perpendicular directions. The other cause, most current among the ignorant, namely, the greater distance of the sun, can occasion no great difference, if we consider the vast distance of the sun from the earth, consisting of so many millions of miles; for this being considered two hundred miles, more or less, cannot be supposed to affect us, at least not in any degree; especially as we know, that the sun is furthest from the earth in the height of summer, and nearest about Christmas, but it then descends so very low, that, from the obliquity of its rays, it gives little or no heat.

winter rages with ſuch ſeverity in the eaſt parts of Norway, that all the freſh-waters are frozen, the lakes and bays are open on the weſt-ſide, though lying in a direct line with the eaſtern parts; the air is miſty and cloudy, and the froſts ſeldom are known to laſt a fortnight or three weeks. In the center of Germany, which is two hundred leagues nearer the line, the winters are, generally, more ſevere, and the froſts ſharper than in the dioceſe of Bergen, where the inhabitants often wonder to read in the public papers, of froſt and ſnow in Poland and Germany, at a time when no ſuch weather is felt here. The harbours of Amſterdam, Hamburg, Copenhagen, and Lubeck, are frozen ten times oftener than ours; for, with us, it is generally known not to happen above two or three times in a whole century; and, which is yet more extraordinary, when the harbour of Bergen is frozen, the Seine, at Paris, may be concluded to be in the ſame condition. Thus our winter at Bergen is ſo very moderate, that the ſeas are always open to the fiſhermen and mariners; and it is ſeldom that the bays and creeks are froze over, except thoſe that reach far up the country towards Filefield, where they meet with keen and dry north-eaſt winds, blowing from the land.* In the other parts, towards the weſtern coaſt, it is but ſeldom, as has been before noticed, that any hard winters, or laſting froſts, are heard of, though travellers, who perhaps come from, or beyond, Filefield, about 20 miles eaſtward, ſay, they have had ſevere winters there for ſome time paſt.

SECT. V.

[illegible] This amazing difference is, according to the wiſe deſign of the creator, requiſite for the well-being of the country; for, as I have already obſerved, the eaſtern parts require a hard winter for their ſubſiſtence, and a mild winter, and open weather is no leſs neceſſary to the weſtern parts, where the inhabitants chiefly main-

* As far as the [illegible] degree, the north sea continues open and moving both winter and summer, except in the creeks, and along the ſhore, in Denmark, Iceland and Greenland, from whence the large maſſes of ice [illegible] are ſeen to float in the [illegible]. In winters of extraordinary ſeverity, when the Baltic is frozen up, the ſwans, which otherwiſe are not reckoned among the birds of this country, [illegible] procure themſelves water, which they are there deprived of; and I have been credibly informed, that the few ſwans, which are ſtill to be ſeen at Syndford, and other places within my dioceſe, were [illegible] from Denmark, in the years 170[illegible] and 17[illegible].

I tain

tain themſelves by their ſea-fiſheries It is expedient for them, that the ſea ſhould be open during the whole winter, for from the middle of January, the herrings, skates, cods, &c are chaſed by the whales towards the coaſt, when the peaſants ſally out in multitudes from the creeks, into the ſea, and thus get a great part of their ſubſiſtance for the whole year; and ſeveral thouſands of the northern peaſants of both ſexes, during January and February, paſs the whole day upon the open ſea, and only towards the approach of night betake themſelves to their huts, in the neighbouring iſlands This mildneſs of the winter is likewiſe neceſſary for curing and ſalting the fiſh, which in froſty weather would be ſpoiled and uſeleſs for if the fiſh ſhould freeze as ſoon as taken out of the water, the ſalt could not penetrate into them, being obſtructed by the ice, and if carried home and kept till a thaw comes on, they ſoon become flaccid and putrified at the bone, and conſequently unfit for uſe; a ſufficient evidence of the abſolute neceſſity, and great benefit of a mild winter, to the weſtern parts of Norway

Winter-fiſheries

SECT VI

If it be farther asked, how is it poſſible that nature can regulate herſelf by the neceſſities of the inhabitants, and give them froſts and thaws at the ſame time, under the ſame climate, I anſwer, that it is no miracle, but purely the reſult of the primary natural diſpoſition of things It is a general rule, that Norway, from its ſituation on the globe, muſt have ſevere winters, but the exception from this rule lies here, the weſtern ſide of Norway lying neareſt to the great ocean, its air muſt be ſenſibly milder, the intenſe froſt being warded off by the conſtant intermixture of warm exhalations, vapours, and miſts from the ſea, which in the lower region of the air, inſenſibly diſſolve the almoſt imperceptible ſharp particles of ice that proceed from the north pole, or congeal in the cold upper regions of the air, but are melted as ſoon as they fall in with the warm vapours of the ſea That theſe exhalations abate the natural rigour of the weather, cannot be doubted, but whether they ariſe from warm ſprings at the bottom of the ſea, continually boiling by means of the central fire, or if this be denied, whether this ebullition be the effect of leſſer ſubterraneous

The natural cauſe thereof

vulcanoes reſembling the mountainous ones on the ſurface of the earth, it would not be pertinent here to determine

Woodward's Theory of the earth p 39, and 52

Without entering into a prolix examination of theſe things, I ſhall only quote Woodward's opinion on this head, " There is a nearly uniform and conſtant heat diſſeminated throughout the body of the earth, and eſpecially the interior parts of it; the bottoms of the deeper mines being very ſultry, and the ſtones and ores there very ſenſibly hot, even in winter and the colder ſeaſons, and 'tis this heat which evaporates and elevates the water of the abyſs, buoying it up indifferently on every ſide, and towards all parts of the globe" And, page 151, he adds, " That the water reſident in the abyſs, is, in all parts of it, endued with a conſiderable quantity of heat, and more eſpecially in thoſe parts where theſe extraordinary aggregations of his fire happen So likewiſe is the water which is thus forced out of it, inſomuch that when thrown forth and mixed with the waters of wells, of ſprings, of rivers, and of the ſea, it renders them very ſenſibly hot" Thus far Woodward

It is ſufficient that experience ſhews the countries remote from the ſea, tho' neareſt to the line, to be ſubject to the hardeſt winters, and that among thoſe countries which are actually encompaſſed by the ſea, none have leſs of the winter, that is of the froſt, ice, and ſnow thereof, than thoſe which lie open to the great ſea, or the main ocean, the mild and warm effects of its exhalations being moſtly felt in winter, when they are moſt copious, having a large range in the atmoſphere, which at that ſeaſon is leſs crowded by the ſolar rays It is almoſt inconceivable, tho' certainly true, that the winter of the year 1708, ſo remarkable for its deſtructive ſeverity, was not remarkably different at Bergen from the other common winters And ſo likewiſe Ireland, Scotland, and the Orkneys, all ſituated towards the weſtern ocean, felt little of the extraordinary rigor of that winter, of which more particular accounts may be read in the Engliſh philoſophical

[a] To remove all doubts, which thoſe who are not experimentally acquainted with this ſingular providence may entertain of it, I ſhall confirm it by the following paſſage from Derham's phyſico theology, B. 4, C. 2. O. which deſcribing the moſt ſevere cold, (namely the warm exhalations from the ſea) we have lately had a convincing proof in 1708, when England, Germany, France and Denmark, and even the more ſoutherly parts of Italy, Switzerland, and other countries, ſuffered ſeverely, whereas

losophical transactions * N° 324. In relation to this truth, a certain French geographer must be allowed to be in some measure right, though the assertion seems very singular and unheard of, "L'air est fort doux en Norvegue, de sorte que la mer n'y gele point, et la neige y est fort peu de tems" i e In Norway the air is very temperate, so that the sea is never frozen, nor does the snow lie long upon the ground.

Les Etats, Empire et Princip du Monde par [illegible] p 77

SECT VII

The cold most severe in the eastern parts

The aforesaid writer probably had his account from some Norwegian, who was acquainted only with the west side of the country, for the description by no means agrees with most of the provinces, and especially all the eastern parts near Filefield The intenseness of the winter is there extreme, particularly in the levels on the mountains, which are far more exposed to the severity of the air than the valleys, and reach towards the upper region of the atmosphere which is much colder than the lower, as the reflexion of the sun is there less powerful, and the air more rarified The usual degree of the cold, especially in January and February, may be sufficiently conceived from hence, that the largest rivers, with their roaring cataracts, are arrested in their course by the frost, and the very spittle is no sooner out of the mouth, than it is congealed, and rolls along the ground like hail A farther instance of the extreme cold, not unworthy notice, especially as it raises astonishment in foreigners, is, that no sooner has a horse dropped his excrements on the ice, than the balls of horse-dung move and leap on the ground The cause of this is the sudden change from heat to cold, which occasions a violent conflict, when the sharp and dense air penetrates forcibly into the lighter, and expels it * It

whereas Ireland and Scotland felt very little of it, more than in other winters But it seems this is what ordinarily befal those northern parts, particularly the islands of Orkney, of which the learned Dr Wallis gives the following account, "Here the winters are generally more subject to rain than snow, nor doth the frost and snow continue there so long as in other parts of Scotland, but the wind in the winter time will often blow very boisterously, and it rains sometimes, not by drops, but by spouts of water, as if whole clouds fell down at once, &c" Likewise Mr Lucas Debes, in his description of the Ferro islands, affirms, "that the winters there are not very cold, though they lie in the 62d degree of latitude, the frosts seldom lasting longer than a month, and are withal so moderate, that no ice is ever seen in an open bay, nor are the sheep and oxen ever brought under cover

* Of the small and piercing darts of ice, as they are called, which are frequently shot forth by the north, and north east winds, the very learned Jens Spidberg deals

on

It is necessary to use great caution in providing against such weather, in which an unexperienced or unguarded traveller may be deprived of his nose and ears, it is particularly expedient to cover the face, and for this the most approved method is to fix a piece of gause under the hat; which both retains the warm effluvia issuing from the body, and keeps off the piercing air better than would be imagined, allowing at the same time sight enough, to guide the horse. Some now and then rub their faces with a handful of snow, as enabling it, better than by warmth, to bear the cold, but in long journeys over the highest mountains, where the air is much keener, and the winter quite insupportable, no precautions would avail, without the convenience of the mountain-Stoves, as they are called, which are kept at the public charge for the repose and warmth of travellers. Of the necessity of these, and the impracticableness of the mountainous and desart parts in the winter-months, the Swedes afford a melancholy instance; and as the like is scarce to be found in the history of any age, I shall here give a short account of it. In February 1715, seven thousand, some say nine thousand Swedish soldiers, together with their officers, perished in a most deplorable manner on the mountain of Ruden, or Tydal, which separates Jempteland in Sweden, from the Diocese of Drontheim, without any other enemy than the extreme cold, which surprised them on the ridge of that mountain, where nobody could come to their assistance. The affair happened in this manner.

Several thousand Swedes perish in the frost.

In the autumn of the preceding year, this corps, which then consisted of ten thousand men, had penetrated into the country, and appeared to have a design upon Drontheim, thereby to clear a passage for the main army, which was at that time under the command of the king in person, and had made an irruption near Frederickshall, and to facilitate its farther progress into

of Christiansand bears the following testimony, "It cannot be denied, that the air towards the north is in winter time full of innumerable particles of snow and ice, which are frequently so large and sensible, that when the wind blows fresh, they dart into the face and give it a pain like the smart of a switch, and they are not only felt, but when the cold is very intense, and the sun shines clear, these particles may be visibly discerned, glittering like so many little Stars." And this accounts, why the north wind is of a more penetrating coldness than any other, that in its passage, it sweeps along the snowy mountains of the north, and thus becomes impregnated, as it were, and loaded with these particles, or lamellæ niveæ et glaciales, which among us occasion such a sharp cold. Supplem. II. Actor. Vratisl. An. 4. p. 71.

Nor-

Norway, but the gallant Danish general Budde, who, in the last invasion of the Swedes, had done his country great service, made such good dispositions against the enemy, that they laid aside their design of attempting Drontheim, and cantoned themselves among the peasants, till the beginning of the year 1719, when, though late, they received an account by express of the unexpected death of the king before Frederickshall. Soon after, advice coming that Count Sponeck was in full march towards them, they had orders to make the most precipitate retreat over those desart and lofty mountains, but just as they had reached the frontiers of their own country, they were overtaken by a storm, accompanied with an extreme cold, and much snow, which so bewildered them, that the greatest part of them perished. A company of two hundred Norwegian sledge-men, under major Emahus, which followed them close to observe their retreat, found the enemy dead upon the mountains, some sitting, some lying, and some in a posture of prayer, all frozen to death. How great their distress must have been, may be judged from their cutting their muskets to pieces, in order to burn what little fuel they could raise from them. The generals Labarre and Zoega were among the dead, but the generals Adlerfeld and Horn barely escaped with their lives, and of the whole body only two thousand five hundred, or, according to others, no more than five hundred, survived this dreadful catastrophe.*

SECT. VIII.

Preservatives against the cold.

From this accidental digression I now return to the cold in Norway, which led me into it, and shall shew, according to my design, that the wise and provident Creator has not left the inhabitants of these cold climates without a greater variety of preservatives against the weather, and more means of keeping themselves warm, than other countries afford. 1. The country abounds in large forests, affording them plenty of fuel, and timber for building strong houses. 2. The wool of the sheep, and the furs and

* Whoever considers this great loss, which was inflicted by the hand of God, and the many other defeats, particularly at Mofs, Frederickshall, Ringerige, Crogsloven, [illegible], and elsewhere, cannot but wonder that Mr. Nordberg, an historian of great merit in other respects, should in the second part of his life of Charles XII. affirm, that the war was carried on with equal advantage, or rather on the Swedish side with considerable superiority. "Par là les forces de Charles XII. furent assez égales à celles de son ennemi. Il fit trois campagnes en Norvegue avec un avantage assez égal et même avec superiorité." An assertion without the least truth. But the circumstances of this last war were never rightly understood by foreigners.

ſkins of wild beaſts, furniſh them with warm linings for their clothes, and good bed-covering. 3 The innumerable flights of wild fowls ſupply them with down and feathers 4 The mountains themſelves ſerve them for fences, and retreats; their ſummits, indeed, are unhabitable, on account of the cold and barrenneſs, but the ſhelving ſides, or interſtices, eſpecially where the expoſure does not face the north or eaſt, enjoy weather that is at leaſt ſupportable But above all it is to be obſerved, that even the cold air occaſions warmth in the bodies of men, its compreſſive force rendering the body more firm and compact, and fortifying it againſt external injuries: and thus the natural warmth is by the cloſeneſs of the pores repelled towards the inner vital parts, and more particularly concentrated in the ſtomach; ſo that the northern people are known to digeſt ſmoked fleſh, dried fiſh, and other food hard of digeſtion, better than any other nations* In ſhort, in this as in every other reſpect, the œconomy of the Almighty towards his creatures is full of wiſdom, goodneſs, and harmony I can even venture to affirm, that were the Norwegians tempted by any thing to change countries with the Italians, the winter's cold would not be the motive to the exchange for this is the leaſt of their complaints, and, for my own part, I cannot ſay that the cold here has ever been more painful to me than in other parts

SECT IX

Great heat in ſummer, and its cauſes,

After this account of the cold in Norway, it is proper to ſpeak of the heat Here I apprehend many would interrupt me with a queſtion, whether it is ever actually warm in Norway? I anſwer from experience in the affirmative for in the beſt ſummer-months it is not only warm, but ſometimes to ſuch a degree, that according to the vulgar phraſe, *it may make a raven gape*, and perſons, who have been born and educated in hot climates, might fancy themſelves ſuddenly tranſported home Particularly in this preſent year 1750, on the laſt day of July and firſt of Auguſt, the

* That the particles of the atmoſphere are more condenſed near the poles, and conſequently preſs more forcibly on bodies, than in the expanded and rarified air of hot climates, is demonſtrated and explained by J Rohault, Traité de Phyſique, Tom II P III C III § 9 where he alſo ſhews, that the mercury riſes higher in Denmark and Sweden, than in France and Italy

heat was ſo exceſſive, that M Haar, miniſter of Waas, and formerly chaplain in the Eaſt Indies, declared he hardly ever felt it hotter in that country; tho' I am inclined, partly, to impute this, to the much ſtronger impreſſion made on the mind by preſent ſenſations, than by the recollection of any paſt*

The cauſe of theſe violent heats (which however are but of ſhort duration) may be partly derived from the valleys incloſed within high mountains, where the rays being compreſſed and confined, the reverberation of them from all ſides muſt occaſion ſuch heats, as were the ſummer of any conſiderable length, would bring grapes, and other fruits and vegetables, to the like exquiſite perfection as in other countries The ſecond, and which is the chief cauſe, is, that in the midſt of ſummer, the ſun's abſence below the horizon, is ſo ſhort that there is no night, at leaſt no total darkneſs, conſequently neither the atmoſphere nor the mountains have time to cool, but often retain part of the heat of the preceding day, and if the general opinion of naturaliſts, that a mineral ſoil emits ſulphureous and hot effluvia, be true, this may come in for a third cauſe of the heat, the country being almoſt every where full of mines

There cannot be a more deciſive proof of the ſummer's heat in Norway, than that ſeveral vegetables, and particularly barley, grows up and ripen within ſix weeks or two months, which, beſides the great profit, is of very conſiderable advantage to the peaſant, as it enables him to begin threſhing when he will, which he is often under a neceſſity of doing very early. It is ſaid, that the ſame happens in Sweden within a much ſhorter ſpace, namely, 36 days, but this I mention only on the authority of the celebrated Olaus Magnus, who has the following paſſage concerning it, "Quoad Aquilonares hoc certum eſt, in pleriſque agris Weſtrogothorum, parte objecta meridionali plagæ, hordeum ſpatio 36 dierum a ſemine projecto maturum colligi, hoc eſt, a fine Junii ad medium Auguſti, aliquando celeriùs" † It is certain that, where nature has but a ſhort time to work, ſhe accelerates her opera- Early harveſt

* It appears, that in the countries lying far north, the great length of the days often renders it warmer than with us Wolffius's Phyſic Part II Chap VIII p m 1150

† On my viſitation in the year 1750, I ſaw at Indwigen, in Nordhoid, barley ripe and mowed on the 29th of July Of the vegetables of the country I ſhall hereafter ſpeak more at large

tions,

tions, and acts with greater energy. In our northern gardens, it is indeed seldom that the winter fruits can attain to their proper maturity, but those of the summer keep pace with those of Denmark, where strawberries, cherries, and the like, are ripe so early as the first of July. Counsellor Carbiner has more than once had ripe figs, in his garden at Bergen; and in Christiana, M. Wilster, an apothecary, has several years brought grapes to a degree very little short of perfect maturity.

SECT. X.

False notions of foreigners concerning the [illegible] in Norway.

From these instances, I presume, foreigners will have the candor to admit, that however natural and lasting the cold may be in Norway, yet the impartial Sovereign of nature has not so far neglected us, but that we may pass our days agreeably, especially, if it be considered, that what the climate of Norway denies, it abundantly compensates in other advantages, of which I shall hereafter have occasion to adduce several proofs, partly in praise of the Creator, and partly for the information of foreigners, and the confutation of that very false idea, which, even in my own country, men entertain of the rigorous and unpleasant climate of Norway, which is seldom mentioned but with a commiseration, of which it is not a pressing object. But no conceit is more absurd than that of Simon Patrick, a native of England, and in other respects a writer of great learning and worth, who represents a Norwegian as one who had never seen a rose (which is a very common flower in Norway) and was afraid to touch it, imagining it to be fire.* Who would have thought, that an European could be such a stranger to Norway, and an Englishman too, who ought to know it better from the equality of its situation with the North of Scotland, this being nearly in the same degree of latitude with the bishopric of Bergen, not to mention the frequent

* This passage occurs in a piece of his, in which he instructs and cautions a friend against [illegible] apostasy from the Christian religion. His words are to the following import: "The poor Norwegian (as history informs us, I think, what history) was afraid at the first sight of a rose to touch it, being apprehensive of burning his fingers; he was astonished that trees, as he imagined, should produce flames instead of flowers; he moved his hand towards it to warm himself, but could not be prevailed with to touch it; but as he was over-joyed to be delivered from such a mistake, being afterwards brought not only to touch but to smell this innocent flower, which at first appeared to him to be a fire, so it will be with us, &c." And [illegible] would it have been with the world's author, had it been his fate to have come to Norway, and there to have seen the roses growing every where.

Voyages

voyages of the Engliſh to Norway, ſome of whom are very well pleaſed to ſettle there, or the conſtant voyages of Norwegians to England, who, if the trade would turn to any account, might furniſh the Engliſh abundantly with roſe-water.

SECT XI

Quality of the air in reſpect to health and ſickneſs

If the air of Norway be conſidered in reſpect to health and ſickneſs, particularly as to the natives, it will appear to be pure and ſalubrious from many inſtances of perſons of a very advanced age, eſpecially among the peaſants Mr Jonas Ramus, in his Chorographical Deſcription of Norway, is of opinion that a more healthy air in ſummer is hardly to be met with any where than in Norway, though I muſt confeſs, that this varies according to the ſituation of places The moſt pure and kindly air, I judge to be, in the middle of the country, eſpecially about the mountains, where the inhabitants have hardly an idea of ſickneſs, unleſs it be hereditary, or contracted by intemperance It is reported, though I will not warrant the truth of it, that in the vale of Gulabrand, which is regularly viſited by very ſalubrious gales, eſpecially in the pariſh of Laſſoe, there are perſons of ſuch an extreme age, that from a laſſitude of longer life, they get themſelves removed elſewhere in order to die the ſooner, that farther in the province of Valders, and in other parts, meal may be kept many years without being worm-eaten, or any other damage, which amounts to a demonſtration of the purity, wholſomneſs, and dryneſs of the air But on the other hand, on the ſea-coaſts, and here in Bergen, I account the air to be leſs healthy from the abundance of humid and ſaline vapours from the ſea, eſpecially in winter, when the miſts and rain are more frequent than clear froſt, yet with the aſthmatic, this moiſt air agrees better than a finer or drier, which may be more piercing; a proof of this I had in an intimate acquaintance of mine, who found his breaſt and lungs conſiderably eaſed after his arrival from Denmark, which I attribute to the air here, as more humid than that of Copenhagen, tho' the latter in winter is not without frequent fogs and rains *

* This may poſſibly be the cauſe that a very dry air hurts conſumptive perſons, by too ſtrong a reſtoration of their weak lungs, and by detaching and carrying off too

Generally ſpeaking, experience, the beſt inſtructor, ſhews the air in moſt places of Norway to be pure and ſalubrious, and even more ſo than in many other countries, as perſons of regular lives, all circumſtances duly conſidered, arrive in theſe parts to the utmoſt extent of the age of man I ſhall produce many memorable inſtances of this hereafter, when I ſhall particularly treat of the inhabitants of the country, and the ſame is evident from the yearly bills of births and burials, which, by his majeſty's order, I tranſmit to Copenhagen I ſhall here only mention, that next to their plain and ſimple food, the Norwegians owe their permanent health and longevity more to their air, than to medicinal arts and precautions, for medicine is very little underſtood here, the little we know of it is learnt from foreigners, and whilſt the lawyers are never at a loſs for clients, practitioners in phyſic meet with very few patients

It is only in the chief towns that phyſicians are commonly to be found, and there they are eſtabliſhed with a public ſalary, as Provincial phyſicians, and in general have but very little employment, even in this populous city of Bergen, among thirty thouſand ſouls, (ſome indeed carry the number higher, but I believe they are miſtaken) there is but one, or at the moſt two phyſicians, and theſe are found ſufficient, whereas in a German city of the ſame extent, ſuch as Lubeck, or Roſtock, ten or more may find an ample ſupport Norway, indeed, cannot be ſaid to be entirely exempt from peſtilential diſtempers, for the Black-death, known all over Europe by its terrible ravages, from the years 1348 to 50, was felt here as in other parts, and to the great diminution of the number of the inhabitants I likewiſe find accounts of great numbers of people of all ranks, ſwept away in the years 1618, 1630, and 1654 But the piercing colds of winter, and the ſtorms ſeem to be a divine diſpoſition for purifying the air, and ſtopping the progreſs of an epidemical diſeaſe The like good effect is produced by thunder and lightning, which diſſipate the ſulphureous and nitrous particles in the air It is a general notion, that ſtorms and tempeſts are more violent here than elſe-

much of the inward moiſture The moſt robuſt perſons ſuffer ſometimes by this extreme ſcarcity of the air The people of the eaſtern coaſt of the Red-ſea are ſometimes obliged to ſprinkle water up the air to moiſten it, and when they breath, hold a wet cloth to their mouths Hamburg Magazine, Part page 8

where,

where, but in this I am inclined to think the ſound impoſes on our judgment, the noiſe and eccho of winds and thunder being much louder among the lofty mountains than in the plain country This difference I have found, that ſometimes, tho' ſeldom, thunder is heard at Bergen in the winter, doubtleſs becauſe that ſeaſon of the year is, as hath been already ſhewn, attended with very little pure cold, but rather with a raw air, and of courſe with more rain than ſnow and hail

SECT XII

Rains and damps on the weſt ſide

As to the humidity of the air, rains being ſo unuſually frequent at Bergen, and for ſome miles round, as to be proverbial among the Dutch, I apprehend the cauſe may be derived not only from the high mountains, there being in other parts of this dioceſe much higher mountains, with much leſs rain, but rather from the many narrow valleys and creeks in the neighbourhood, which become ſoon filled with their own evaporations as well as thoſe from the ſea, and theſe are not ſoon diſpelled by the wind or ſunſhine, except in the heat of ſummer, when the ſun has ſufficient power to draw them up into the open air above the ſummits of the mountains, there to be ſeparated and diſpelled by the wind Whereas, on the contrary, in other ſeaſons of the year, when the power of the ſolar rays is weakened, the vapours cannot riſe to any conſiderable height above the horizon *. Hence we ſee them hover like rain-clouds, and reſt not only on the tops of the mountains, but often hang about their ſides, inſomuch, that the top may be clear, and the middle of the declivity be covered with theſe rain-clouds and when travellers or peaſants happen to be ſurprized among them, which is a common caſe, their ſight is ſo obſtructed, as not to ſee their way, they breath with difficulty, grow wet and cold, and un-

See a view of Bergen, fig. 1

* If the old opinion, of the ſun's exhaling the vapours upwards, ſhould not prevail againſt the new, which holds, that ſmall veſicles of air are impelled upwards, and being lighter than the lower air, float in it Wolff's Phyſic Cap v Sect 24, Yet my conjecture on the rain at Bergen ſtill keeps its ground for the eminent naturaliſt juſt cited, allows that the winter-vapours are heavier, and ſo ſuch ſink lower into the atmoſphere, or cannot aſcend ſo high, the teguments of their ſmall veſicles being then condenſed, ſo that the effect produced is the ſame This words are, Sect 264, "The vapours being rarified by the heat of ſummer, they then riſe to a great height in the air" Again, "the groſſer vapours, having a thick tegument and a ſmall cavity, are heavier, and remain in the lower region of the air, this being of a more denſe nature than the upper, thus in winter, the vapours being condenſed by the cold during that ſeaſon, remain in the lower parts of the atmoſphere

leſs

lefs they fpeedily reach the open air their health is endangered. Thefe rain-clouds are like fpunges fwelled with water, and on any preffure, or when driven againft the mountains, difcharge their waters in heavy rains, and caufe that conftant humidity *. On this account, indeed, Bergen is not fo pleafant to live in as feveral other places in Norway are, and the women, who feldom have the ufe of coaches, are in all weathers obliged to wear a woollen or filken black veil over their heads, whilft the men fecure themfelves from the rain by rain-hats, made like umbrellas

SECT XIII

The wife difpofition of Providence in this

As one of my chief views in this work is, according to my fhallow knowledge and infight into the harmony of things, to fhew that all the works of God are full of loving kindnefs, I muft here obferve that the moift and rainy weather, which prevails all over the weftern coaft of Norway, but chiefly about Bergen, is excellently adapted to the neceffities of the country, and in feveral refpects contributes to its welfare First, it is of great benefit to the countryman in his corn and hay-harveft, for the thin furface of earth on the high rocky mountains, which line the weftern coaft, requires a great deal of moifture, otherwife it would not yield even grafs, and much lefs would it produce corn, it would literally anfwer to the parable of the feed, *which fell on a rock and withered away, becaufe it lacked*

* Edward Dipper, in his voyage to Africa, page 56—58, thus accounts for the heavy rains in Ethiopia, which caufe the famous inundations of the Nile, " the fun-beams, fays he, exhale the vapours, afterwards the middle air, which is cold, and adheres to the cold fummits of the mountains, diffipates the clouds which the north-wind has aggregated or difcharge them in rain " What this writer attributes folely to the north wind [illegible] profeffor Kraft [illegible] on better grounds, judges to be an effect of that attraction which is not [illegible] on high mountains, but in fome meafure affects the whole globe, which revolving like a wheel, has an attractive power His words are thefe [illegible] I have often obferved in fair weather the high mountains to be covered with a thick cloud, as foon as there is the leaft [illegible] in the air, and from hence it is that in mountainous countries, the rains are both more frequent and more violent, than in a [illegible] country " The fingle caufe of this, is, the attraction of the mountains, to the attractive power of large mountains, may in fome meafure be proportionate to the attractive power of the earth therefore when neither of thefe attractions are impeded in their operations, and the proportion is adjufted, the direction in which a particle floating in the air moves towards the mountain may be determined This [illegible] proved from the ingenious obfervation made by Meff Bouger and de la Condamine on a mountain called Chamborazo, in Peru, when their plummet was by the mountain drawn afide from its perpendicular direction The fprings found on the tops of mountains are produced by this attraction and as many particles of [illegible] are feen in connection, fo many inftances are there of this attractive power Reflections on the Newtonian and Cartefian Syftems, by profeffor Kraft, in Actis Soc [illegible] Tom [illegible] p 54 [illegible]

moiſture Thus theſe deficiencies, in reſpect to vegetation, are ſupplied by the rain which continually moiſtens the little earth we have Indeed, in moſt places, the rain would not be ſufficient without the maſſes of ſnow on the tops of the mountains, or when theſe are wanting, the many pieces of ſtanding-water on their ridges, which ſometimes by ſubterraneous oozings, ſometimes by gentle ſtreams, thoroughly water the earth, and afford a conſtant refreſhment to the parched ſides of the mountains Whereas, in the vale of Guldbrand, and other parts where the rains are not ſo frequent, and the mountains not ſo ſteep or thick ſet as here, the water is conveyed into the fields by trenches, and thrown upon the cultivated ground with ſhovels, as is practiſed in Perſia, and other hot countries A ſecond benefit of this wet and rainy weather, eſpecially when calm withal, and chiefly in ſpring, is, that it gives fiſhermen the advantage of larger draughts, for in clear and open weather the herrings, ſkates, &c which are every year taken here, and in Nordland, to the amount of many tuns of gold, are generally ſhy of venturing near the ſhore, and into the bays, but in rainy or hazy weather, the fiſhermen meet with numberleſs ſhoals of them

SECT XIV

In the preceding articles, I have ſhewn the diverſities of the northern air, in reſpect to cold and heat, froſt and thaws, both in thoſe provinces which are equidiſtant from the line, and in the eaſt and weſt parts of the country, and it is the ſame in reſpect to fogs and rains Filefield uſually makes a very remarkable difference betwixt us and our neareſt eaſtern neighbours, in the province of Valder, inſomuch that when it is foul weather with them, with us it is fair, and ſo vice verſa The courſe of the air, when impelled againſt the higheſt mountains, is checked, for it ſeldom aſcends to paſs over them Of this I was an eye-witneſs, in my return from Chriſtiania in 1749, when travelling on the 24th of June over the higheſt part of thoſe mountains, I obſerved thick rain-clouds hanging over Valders, which we had left, and where it had been rainy for ſeveral days, upon the hill we had a little fleet, but in the valley of Laerdale, where we arrived in our deſcent from the mountains, the weather was

Diverſity of weather in different parts of the country

warm and dry, and had been ſo for a conſiderable time before But this caſe is common to Norway, with other mountainous countries, which I ſhall here take occaſion to illuſtrate by ſome parallel inſtances: We are informed *, that whilſt the ſummer ſeaſon laſts, from cape Comarin to the coaſt of Coromandel, it is winter during that time, from Diu to the aforeſaid cape In like manner, on one ſide of the mountain called Gates, or Ballagates, the fields are cloathed in their verdure, and the country appears in all the gaiety and luxuriancy of ſummer, whilſt, on the other, it is covered with fogs and rain Something ſimilar to this is alſo obſerved from Ormus to Cape Roſalgate, where the ſhips may harbour and enjoy the moſt delightful weather imaginable, whereas beyond the cape they meet with hard gales, rain, &c A further account of theſe remarkable particulars the reader may meet with in Paul van Caarden's voyage to the Eaſt Indies

SECT XV

Deep ſnows on the mountains, their advantages and detriment

From the conſideration of the rain, I am naturally led to ſpeak of the ſnow, eſpecially as both are the ſame in ſubſtance, differing only in texture and figure, which depend on the warmth or coldneſs of the air, as I myſelf experienced in coming down a mountain, where, till about half way, we had ſnow, but a little lower the flakes of ſnow were melted into drops of rain Now in Bergen theſe ſnows ſeldom lie long, for it muſt be a very extraordinary winter, when the ſledges are uſed a fortnight ſucceſſively; whereas in the other northern provinces the ſnows are very thick and laſting, and lie long, and on the ſummits of the mountains, or in the cavities far north, which are inacceſſible to the ſun-beams, the ſnow lies throughout the whole year, and the contraſt betwixt the lively verdure of the fields and the gliſtering whiteneſs of the mountains is not diſagreeable The upper region of the air, (where the atmoſphere being thinner than near the earth, the ſun-beams are leſs intercepted and reverberated) is always extremely cold, even in the warmeſt countries This is the caſe in Switzerland and Italy, and even in Perſia, according to Taver-

* Concerning this I refer the reader to the northern voyages with Mr Robert Boyle's Inſtructions for travelling with advantage where we find the above obſervations on the difference of the air in hot countries at a ſmall diſtance from each other

mer, and in Ethiopia, according to Ludolph and others, the tops of the mountains, as here in Norway, are covered with ſnow both in winter and ſummer In ſome places far north the undermoſt lays of ſnows, by long lying, turn to a bluiſh ice, called in our language, Jiſbrede, which ſometimes ſlides down to a conſiderable diſtance over the lower grounds, to the no ſmall detriment of the peaſants. In Juſtedale, which lies high among the mountains, one of theſe Jiſbredes, detached from an ice-mountain, deſtroyed ſome farm-houſes and lands, and further damage is yet to be apprehended *

However, both here, and in other parts, eſpecially in the eaſtern, the ſnow is highly beneficial to the peaſants, partly in forming a paſſable road in the winter, without which all traffic and intercourſe with the champaign country would be cut off, yet here they are often obliged to put on their Truviers † (a kind of ſnow-ſhoes, broad and round, made of withies, for keeping the feet from ſinking in the ſnow) and ſometimes they muſt even be put on the horſe's hoofs. Another contrivance for travelling on the ſnow are ſkies, or long and thin pieces of board, and ſo ſmooth, that with them the peaſants wade through the ſnow with all the expedition of ſhips under full ſail In war time a corps of 4 or 600 of theſe ſkie-men are very ſerviceable as light troops, for reconnoitring, procuring intelligence, or for any ſudden enterprize, no place being inacceſſible to them, and they being always ſure of coming upon the enemy by ſurprize The ſnow alſo improves the fertility of the ſoil, and is ſuppoſed in ſpring, to anſwer the ends of manuring, it likewiſe ſerves for a fence and ſhelter againſt ſevere colds and winds When the ſnow is not off the ground early enough in the ſpring, for the huſbandmen to begin the work of that ſeaſon, they ſpread over the ſnow a kind of rich black mould, which, in a few hours, entirely diſſolves it But, on the other hand, the peaſants are often ſufferers by the ſnow, which, when it falls in great quantities, and lies

* Nix jacet et jactam nec ſol pluviaq, reſolvunt
Indurit Boreas perpetuumq, facit Ovid

† Some entertaining accounts of theſe Truviers, or ſnow-ſhoes, which in other parts are alſo called Rickets, are to be ſeen in Hennepin, Tom II chap 27 and in the ſeveral hiſtories of the countries and nations of America

long

long on the ground, destroys thousands of young trees: likewise when it falls late in the spring, and after the trees begin to put out their leaves, which, however, happens very rarely, some trees, and especially the alders, wither and die, a prognostic of which is the leaves turning to a brownish hue. It has been known, and particularly in the year 1742, many people were eye-witnesses of it, that a species of black maggots fell along with the snow, whereby extreme damage was done to the grain and pasture. But among the mischiefs occasioned by snow, the greatest are the

Snow falls.

Snee-skreed, or *Snee-fond*, that is, when a mass of snow, falling from a precipice, overwhelms both men and cattle, oversets boats in the lakes [*], and, which is but too often the case, demolishes cottages and houses, insomuch that even whole villages are born down, crushed, and totally destroyed; but this last calamity is rather an effect of the incredible violence of the wind, driving on the masses of snow, when they begin to give way, than of those masses themselves, houses having been seen to fail some seconds before the snow had reached them. These snow-falls are of two kinds; the first, when in frosty weather the light snow is suddenly set in motion, and in its progress scattered over all the country, which the peasants call Meel-fond, and is not attended with such damages as the other, which is known by the name of Kremfond; these happen, when by the mists and rains in spring, the snow, which by moisture is consolidated, falls in a mass, which, tho' slower in its descent, leaves stronger impressions on the sides of the mountains, bearing down every thing in its way, even the strongest new buildings.

A whole parish overwhelmed by the snow.

By a snow-fall of the first kind, a whole parish, situate between Quindherret and Hardanger, a century or two ago (for the precise time is not certainly known) was wholly covered, and so re-

[*] These accidents it seems are not unknown in Switzerland. "[illegible] du haut des montagnes des masses de neige prodigieuses, que [illegible] appellent Lawinen [illegible] les Romains Avelanches, qui tombant avec rapidité, font un bruit aussi grand que celui du tonnerre. Non seulement [illegible] mais elles entrainent et emportent des arbres et des maisons [illegible] Claudien qui vivoit au [illegible] siecle, nous apprend qu'on connoissoit déja [illegible] tems.

——— [illegible] tos hausere profunda
Vasta mole nives, cumque ipsis saepe juvencis
Naufraga [illegible] merguntur plaustra [illegible]
Interdum subitam [illegible] ruinam;
Mons dedit [illegible]

[illegible]

mains to this day, the ſnow which had thus fallen from the adjacent mountains, not diſſolving the year after, was further gradually increaſed, and hardened by lying, the ſituation being high, and hemmed in among the mountains Many lives were loſt in this diſaſter, of which no memorial would remain, were not the truth of the ſtory, which was at firſt much doubted, ſtill confirmed by ſeveral utenſils, as ſciſſars, knives, baſons, &c brought to light by a rivulet which runs under the ſnow, an inconteſtable evidence that this ſpot was formerly clear of ſnow, and inhabited Such diſaſters, God be praiſed, are ſeldom heard of, and the perpetual ſnows which always cover the ſummits of the higheſt mountains, may, notwithſtanding, be juſtly ſaid to be rather neceſſary and advantageous, than abſolutely detrimental, and thus may be reckoned among the bleſſings of providence Experience ſilences all cavils on this head, the ſnow being known, by age, to become ſo firm and indurated, that a horſe's ſhoe makes no impreſſion on it, and as it yields very gradually to the ſun, it is thus ſparingly diſpenſed for the daily benefit of the inhabitants beneath, except in a damp ſoutherly wind, which penetrating the ſnow, the mountains pour down whole torrents. Theſe accumulated ſnows thus become conſtant ſprings for promoting vegetation in the champaign grounds, and when theſe ſprings are too early exhauſted, the graſs and corn inevitably ſuffer, and are ſometimes withered for want of moiſture Another convenience of theſe currents, and likewiſe of their impetuous deſcent, is, that they drive great numbers of little mills, every farm-houſe * having its own mill A third advantage of them redounds to the oxen, cows, ſheep, and goats, which in ſummer are turned out upon the mountains for paſture, where they are ſo extremely tormented with the heat, with gnats and muſketoes, that they run about regardleſs of danger, and in this frenzy many have loſt their lives, falling down the precipices, this lays the peaſants under a neceſſity, where no ſnow is near, of building ſheltering places for the cattle, but if any ſnow-hill be in ſight, the cattle move towards

* In the eaſtern provinces, which are leſs mountainous, the people not only labour under a great ſcarcity of water, but in ſeveral parts, the mills are at a great diſtance, but this evil might be remedied, if hanging wheels were uſed inſtead of fixed ones, there are but few places where a ſufficient water might not be found for thoſe, which require ſo much leſs than the others now in uſe

it, knowing they ſhall there be relieved by the coolneſs, which it communicates to the air. A further remarkable inſtance of divine goodneſs in this caſe is, that juſt as far as the ſnow melts, and runs from the mountains, the very beſt graſs is obſerved to grow, and in the greateſt plenty, its warm covering, ſo far from being an obſtruction, both forwarding and improving it. Such are the effects of infinite power, wiſdom, and goodneſs, even where at firſt ſight they are leaſt expected.

SECT. XVI.

Concerning the particular winds.

It will not be improper to ſubjoin ſome account of what I have collected in my annual circuits, by my own experience and that of others, relating to the winds in Norway. The winds which moſt prevail here at Bergen, and all along the weſtern coaſt, are the ſouth, ſouth-weſt, and ſouth-eaſt, which laſt is uſually called the Land-South. And in moſt winters, when on the other ſide of the mountain called Filefield, the north, the eaſt, and north-eaſt winds uſually bring on and continue the hard froſts, they ſeldom laſt a fortnight on the north of the mountains called Nordenfield, towards the ſea. Here we generally enjoy a ſoutherly wind, which together with the warm vapours, are, as I have already obſerved, ſubſervient to the provident end of the Creator, in keeping open the ſea for the fiſhermen, and warding off the ſeverity of the winter, of which we have leſs than they who live in the middle of Germany, altho', in exchange, we have rain and foul weather, which is not ſo pleaſant as a clear froſt. It is ſeldom that the wind here is directly weſt, it is generally ſouth-weſt, or ſouth-eaſt, which fills the creeks with the ſea-vapours in abundance, which afterwards, floating among the mountains, become rain-clouds. A north, north-weſt, and eſpecially a north-eaſt wind, are little known here, but when they blow, they verify the words of Solomon, *the north-wind driveth away rain*.

The eaſt winds, which frequently come from the ſhore, and drive the watry clouds out of the creeks, are beſides very temperate, and ſo are accounted the moſt ſalubrious winds, and are the more welcome to us, as uſually cauſing dry weather, but on the contrary, ſouthward, beyond the mountains, they commonly bring rain. The inhabitants of the large province of Nordland, who,

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in not leſs than two hundred barks, viſit Bergen every year, at the fair and the aſſizes, and moſt of whom have upwards of an hundred leagues to ſail, are often favoured with the north and ſouth winds, like regular trade-winds, though not ſo infallibly to be depended on The wind which is, with the greateſt certainty, expected towards harveſt, is the north-eaſt, called Hambakke, which name it derives from the melting of the ſnow at that time from the ſummits of the mountains, but there is alſo here, in ſummer time, and in a clear ſky, another kind of a daily trade-wind along the coaſt, and in the creeks, known by the general appellation of Soelgangs-Veyr, the weather of the ſun's courſe, and in Northland, Soelfar-Vind (the wind of the ſun's courſe) the wind then following the ſun Nic Hartſoeker attributes this alternative to the ſun, which in the morning heats the coaſt, and conſequently rarifies the air, but on its declenſion in the evening, the air cools, and conſequently recovers its gravity, and being thereby become heavier than the ſea-air, its own weight carries it thither, and occaſions a kind of ebb and flood in the air, the fluid parts whereof undergo the ſame agitation as water * A little before noon in the ſummer time, comes on a weſt, ſouth-weſt or north-weſt breeze, and holds till towards midnight, it is called Hafgul, (ſea-cooler) as coming from the ſea, and indeed it tempers the heat, which otherwiſe in the creeks and narrow valleys, would be inſupportable Oppoſite to this is the Landgul (land-cooler) or eaſterly breeze, which beginning at midnight, or two hours after, continues till within two hours of noon, when it uſually ceaſes, towards harveſt the land-cooler begins to get the aſcendant, and the ſea cooler to relax, and then the former is called the Korn-moen, i e Corn-mother, bringing a ſenſible warmth along with it

Conject. phyſ. L. II. Diſc. II. p. 5

Beſides theſe regular winds, the coaſt is ſubject to Field-flagers (mountain ſqualls) or guſts from the land, by which, without the

* To theſe viciſſitudes of the ſummer winds, which are in ſome degree regular, is applicable what Ariſtotle's diſciples write of the Eteſiæ, which were known in Greece, "Quod ad Eteſias attinet, cauſam harum aliqui eſſe reſolutionem nivium in hyperboreis ſuppolaris regionis montibus, quæ uti à ſolis radiis vehementer atque in exhalationes reſolutæ, interdiu ventorum ſuppeditabant materiam, ita noctu deficiente nivium reſolutione cum ſole quibuſdam quaſi induciis conſtitutis, ventos pariter ſilere cogebant" Athan Kircherus in mundo ſubterr P I L IV Sect II cap III p 196 Likewiſe Dr Arbuthnot in his Treatiſe of the Effects of the Air upon the Human Body "The winds, when ſtrong, correſpond to each other [illegible], when they relax, they differ, as this proceeds from local cauſes It is alſo clear that the Alpine ſnows influence the weather in England, as well as [illegible] at Zurich"

almoſt

utmoſt precaution a veſſel is ſuddenly loſt in the ſecurity of fine and calm weather, for theſe blaſts iſſuing in a narrow and violent current from the clefts of the mountains, or from the vallies, behind a cape, or from the points of the high mountains, and being violently impelled againſt an oppoſite mountain, this reverberation cauſes a kind of hurricane in the air, which, for a time, may deprive the unwary of his ſight *

Hurricanes or whirlwinds

But the real hurricanes, or whirlwinds, which ariſe, though ſeldom on the open ſea, are known to be extremely dangerous to ſhips, by their ſudden and rapid vortex, which throws the ſea at a ſmall diſtance into ſuch an agitation, that the water in drops flies up into the air like ſmoke The common people, from an old ſuperſtition, call them Ganſkud, conceiting that a necromancer, of Fin-lapland, has then ſent out his Ganſly, as they call it, to do miſchief, but the true cauſe of the hurricane, is the ſudden exploſion of a wind confined and agitated in a thick cloud, which being impetuouſly diſcharged upon the water, the ſurface is ſeparated, and riſes up into the air like duſt or ſmoke, and hence, amongſt us, this hurricane is very properly called Roeg-ſlage, i e ſmoke-ſquall

I ſhall take this occaſion to mention another wonderful phenomenon of the air, which likewiſe proceeds from denſe, and violently agitated clouds, not as any thing new and unknown in the warm climates, but as being, however, ſomewhat rare, and by experience very well known in the north I mean the water-ſpout, or Trompe de mer, of which a credible perſon, who ſpent his younger years at ſea, gave me the following account, that on the wide ſea, betwixt Shetland and Norway, he and his crew, to their great aſtoniſhment, obſerved, in clear weather, and an eaſy breeze, a cloud gradually deſcending towards the water, and in the ſhape of a funnel, or rather a ſpiral ſnail-ſhell, attracting from the ſurface of the ſea a column of water of a conſiderable diameter, and this ſuction continued all the time they were in ſight Some hours after came on a very violent rain, which, unqueſtion-

Water-ſpout

* Whether it be poſſible that a man and horſe may be carried forward by ſuch a whirlwind and driven back by another ſtronger wind meeting him, without any damage to either man or horſe muſt reſt upon the authority of a very credible writer, Mr Lucas Debes, in his Deſcription of the Iſland Faro, p 9

ably conſiſted of the water, which that ſpiral cloud had a little before exhaled from the ſea *.

Filled with aſtoniſhment at the many and ſtupendous works of the Almighty (eſpecially in the air and its phænomena) I cloſe this ſubject with his own words in the xxxviith chapter of Job, verſe 24, &c *By what way is the light parted which ſcattereth the eaſt wind upon the earth? Who hath divided a water-courſe for the overflowing of waters, or a way for the lightening of thunder? To cauſe it to rain on the earth where no man is, on the wilderneſs, wherein is no man? To ſatisfy the deſolate and waſte ground, and to cauſe the bud of the tender herb to ſpring forth? Hath the rain a father? or who hath begotten the drops of the dew? out of whoſe womb came the ice? and the hoary froſt of heaven, who hath gendered it?* Concluſion

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CHAPTER II

Of the ſoils and mountains of Norway.

SECT I *Of the ſoil of Norway in general* SECT II *Several kinds of ſoil, as mould, clay, ſand, turf, mud, &c* SECT III *Two kinds of mountains* SECT IV *Extenſive chains of vaſt mountains, as Kolen, Sevberg, Doſre, and Filefield.* SECT V *Many leſſer mountains in all the provinces* SECT VI *Deep and long cavities, like ſecret paſſages in ſome mountains, with conjectures on the origin of them* SECT VII *Effect of the deluge in diſſolving and ſoftening ſubſtances, which are at preſent of the hardeſt kind, but appear manifeſtly to have been ſoft heretofore* SECT VIII *The origin of mountains, rocks, and ſmaller ſtones, deduced from the foregoing argument* SECT IX *Detriment of ſo many rocks and mountains to Norway* SECT X *Advantages of them, according to the wiſe and bountiful deſign of the Creator*

SECT I

THE diverſity which I have ſhewn in reſpect to the air, light, heat, cold, rains, and winds of Norway, is no leſs obſervable in the various ſoils of the earth, in the mould, ſand, Of the earth and ſoil of Norway in general

* Mr Lucas Debes, p. 12, of his Deſcription of Ferro, ſays, that ſuch a ſpout among the Greeks, called Typhon, and among the northern people Oes, ſor it before the water, making a deep vortex in the ſea, drew up ſome laſts of herrings and afterward dropt them on Kolen, a mountain about twelve hundred feet in height, page 14. He imagines that it is theſe Oeſer which in Norway attract ſtones, fiſh, mice, and, what is more remarkable, limbs, and afterwards throw them down again; of which a further account will be given in its place.

rocks, ſtones, and mines These I ſhall treat of according to my ability, till ſome ſuperior pen gives a more perfect account of them, to which this imperfect Eſſay may prove an inducement.

As the mountains of Norway, in general, conſiſt of rocks, intermixed with quarries of marble, free-ſtone, ſand-ſtone, ſlate, mill-ſtone, &c which, towards the ſea, are almoſt ſtripped of earth, by the force of the winds, and in the creeks, and further in the country, are covered indeed with earth, but not more than a few yards deep, and very often leſs, one would be apt to think, that below this ſlender covering, the whole kingdom of Norway is but one ſolid ſtone, only of a different nature, figure, and height But the error of ſuch a concluſion is evident, not only from the many deep creeks running up the country, but freſh-water lakes, ſwamps, and fens, in ſome of which, though ſounded with lines of ſeveral hundred fathoms, no bottom has ever been found And to this may be added, that however mountainous and craggy Norway in general is thought to be, yet it affords many champaign well cultivated tracts of ſix, eight, or ten leagues, and more in extent, as Jedderen, the lordſhip of Nedenaes, Hedemark, and other parts, which are a conſiderable exception to the general rule

SECT. II.

The ſoil of ſeveral kinds

The ſoils, as in other countries, are very different here, conſiſting of a black mould, ſand, loom, chalk, gravel, turff, mud, &c. In many places, when the inhabitants are digging deep for a ſpring in dry ground, all theſe kinds are found lying over each other in unequal ſtrata, and three or four ſucceſſions of them The black mould which generally lies uppermoſt, is exceedingly fine and mellow, and fit for all ſorts of vegetables, inſomuch, that if not damaged by the cold, which ſeldom happens in the dioceſe of Bergen, the huſbandman finds his labour amply compenſated, for the ground yields five, ſix, or ſeven fold, and ſometimes even more His harveſt conſiſts for the moſt part of barley and oats, with ſome rye, and here and there peas and buck-wheat, but of theſe I ſhall treat more fully when I come to the vegetables, or products of the earth I have only to add here concerning the ſoil of Norway, that betwixt the mountains, and in the dioceſe of Bergen, it moſtly conſiſts of an aſſemblage of

of ſuch earth as from time to time hath rolled down with the fragments of the rocks, or been waſhed off from the mountains, and ſettled either at the foot of the mountains, or on the ſides, and by theſe acceſſions the vallies in many parts have been conſiderably raiſed. This appears evidently from one remarkable circumſtance, that the fields in the vallies are naturally formed like a camp, the regular eminences and gentle ſlopes looking like the ramparts of a fortification. A ſtrong inſtance of this, is the famous valley of Vig in Sognefiord, and Eidet in Nordfiord, where, a ſtranger, at firſt, would imagine the corn fields, as they lie raiſed above each other, to be ſo many batteries erected by art, though with ſome irregularity. All theſe terraſſes have gradually riſen from fragments of rocks, and eruptions of ſprings, which have repaired the loſs and damage ſuſtained in ſome places, by depoſiting the ſoil in other adjacent parts in theſe regular ſquares, which were thus formed by the light earth and ſand, brought thither by the courſe of the waters.*

The ſand of Norway is ſeldom of the white kind, which is at the ſame time the fineſt, but it is uſually brown or greyiſh, and that on the ſea-ſhore is of the coarſeſt, being rather particles of ſtone, as may indeed be ſaid of all grains of ſand, but particularly of theſe, their ſubſtance being ſo hard that they are not ſo eaſily diſſolved, nor fit to be ſtrewed about like the other. The little fine or white ſand we have in Bergen, is never pure, but very much mixed with powder of muſcle-ſhells, that is, with the fineſt chalky ſubſtance.

Syndfiord, Juſtedale, and ſome other parts afford a kind of ſhining ſand, as if mixed with antimony, or with iron or tin-duſt. This is moſtly uſed for writing-ſand, and as ſuch exported. Tavernier, Chap. xxiii. p. 284. of his Travels to Perſia, relates, that the Portugueſe carried ſome of this glittering ſand from Ormus to Liſbon, and at firſt made cent per cent of it, but this trade being founded on a falſe expectation, ſoon came to nothing. The

* Relative to this is the following paſſage from Baron Leibnitz's Protogæa, Sect. xxxix. pag. 71. Cætera ingentium naturæ mutationum veſtigia non nihil tangamus, habitatoribus fortiſſe antiquiora. Non illis tamen immorabimur quæ in noſtris oris expreſſa non habentur. Ægyptum Nilo, Arelatenſem agrum Rhodano deberi Ariſtoteles et Peireſkius credunt, Nannius Bataviam munus eſſe Boreæ Rhenique. Certe flumina materiam advehentia ſpoliant ſuperiores terras, filiuque quotidie noſtris detrimentis ditantur.

usual

uſual grains of ſand, or little round ſmooth and pellucid ſtones, are ſuppoſed, by Mr Buffon, in his Natural Hiſtory, lately publiſhed, to be only glaſs particles grinded, or a vitreous ſubſtance, the remains of the great univerſal diſſolution, and of the vitrification conſequent thereupon, which our earth appears formerly to have undergone But on this we ſhall enlarge in the ſequel.

Clay, both yellow and blue, is to be found in the creeks, but in greater plenty every where further up the country, particularly in Hedemark, and near Chriſtiania and Drontheim, where they have lately begun to uſe it for earthen-ware, and if the ſame manufacture was carried on in other parts of the country, we might have a ſufficient ſupply without importations from abroad. It is not much uſed for bricks, as moſt of the houſes are built of timber, or of a kind of building-ſtone, which the Dutch, and other foreigners, bring hither as ballaſt, and ſell them here However, clay will, by degrees, come to be uſed for tiling, eſpecially in the country, as the price of næver, or birch-bark, which has hitherto been the uſual covering for houſes, riſes every year, and great numbers of trees ſuffer by the uſe of it Other finer and richer clays of a dark brown and yellow colour, and uſed by painters, are alſo met with in ſeveral places, and particularly at Ringerige, is a kind of black clay, not inferior in its fineneſs to Terra-ſigillata, and by the peaſants uſed as blacking

Turff, both brown and black, which is the beſt, is found in many parts, and chiefly where the wiſe Creator foreſaw, that in the courſe of time it would be moſt neceſſary, namely, in the leſſer and greater Peninſula's, or Udoers (tracts of land projecting into the ſea to a conſiderable extent, and joined to the continent only by a ſmall neck) where the weſt-winds hinder the growth of woods, which are further thinned by ſhip-building, ſo that without turf, the peaſants and fiſhermen would be very much diſtreſſed, eſpecially as they are obliged to fetch the greateſt part of the timber for houſes and barks from the continent. Now, as amongſt the turf, both here and elſewhere, there are at the depth of ſome yards, branches and roots, and many very large, even ſtocks of firrs and pines, which the turpentine has preſerved, this ſhews the earth to have been gradually filled and as it were grown up from a mixture of leaves, twigs, moſs, reeds, and the like,

and the ſentiment of ſome philoſophers attributing to it a vegetative or ſelf-renewing power, by which it grows again, tho' ſlowly*, is confirmed by experience, the beſt inſtructor, for ſufficient inſtances of it appear in Denmark, Luneburg, Frieſland, Holland, England, and Picardy in France. On this occaſion, I muſt obſerve, concerning the large bodies and parts of trees ſo frequently found among this vegetating turff-ground, that they are not ſuch convincing teſtimonies of the deluge, as ſome account them, a much better proof may be drawn from other foſſils, which never could be natives of the places where they are found; of this kind, particularly, is that entire ſkeleton of a whale, accidentally found in 1687, in Tiſtedale, near Frederickſhall. It was buried with earth and ſand, at leaſt 240 feet under ground.

Skeleton of a whale found

The ſwamps and marſhes, or Myrs, as they are called here, lie both on the ridges of the mountains, and in the vallies, at the foot of the ſteepeſt precipices, theſe, in many places, render the roads very unſafe, they being paſſable only in the drieſt ſummer months, and ſometimes not even then, unleſs a kind of cauſeway is formed over them at the public charge, with thouſands of logs and large pieces of timber laid acroſs the marſh, which are ſoon rotten In theſe places the ground is as ſoft as dough, yielding and moving under the foot, there being, probably, beneath theſe marſhes, an abyſs of ſtanding water, which is thus weakly vaulted over Near Læſſoe, in the dioceſe of Chriſtianſand, this timber cauſeway is carried on for near a mile, and if a horſe, or a much leſs animal, happens to make the leaſt wrong ſtep, he ſinks beyond recovery

That there are coal-mines in Norway, and eſpecially in the dioceſe of Aggerhuus, where the late governor Ditlef Wibe, a gentleman ever attentive to the proſperity and improvement of the country, employed ſome ſkilful perſons in a ſearch of them, not altogether unſucceſsful, is what I have been informed of, but not with a certainty to advance any thing poſitive on the ſubject The yellow, clear, and ropy ſubſtance on the ſurface of the water in

* The excellent, though not infallible philoſopher, Baron Leibnitz, falls into a miſtake, when he ſays, in his Protogæa, Sect xliv pag 82 Torfam exciſam renaſci nondum compertum eſt, etſi aquæ advehant in vicinis locis jam natam And pag 83 Longum eſſet expectare dum torfa renaſcatur, nec forte hoc contingeret, niſi in orbe alio poſt Platonicam rerum revolutionem

the ſens, which is ſaid to be an indication of coal-mines, appears in great quantities in ſeveral places. If coal could be found in thoſe provinces, which are not overſtocked with wood, it might encourage the opening of more mines, the country almoſt every where abounding in metallic mines, beſides thoſe already wrought.

SECT. III.

Two ſorts of mountains.

From treating of the low and level ſoil of Norway, we are naturally led to the mountains and rocks, with which the greateſt part of Norway is covered. For the more accurate deſcription of theſe they muſt be divided into two ſorts, ſome being general, and extending themſelves thro' the whole length of the country, whilſt others are ſcattered about, or ſurrounded with a level country, tho' many of theſe may be conſidered as branches or excreſcences ſpringing from the roots of the former.

SECT. IV.

The firſt ſort of theſe mountains are ſuch, as are properly called Juga Montium Concatenata, or a long continued chain of mountains, the direction of them here is not tranſverſal, but from the ſouth towards the north pole.* M. Emanuel Suedenborg, in his Miſcellanea Obſervata, p. 7 & 9, aſſigns the cauſe to the winds prevailing at the time of the deluge, which gave this poſition and figure to the matter firſt hardened. " Obſervari poteſt plerorumque horum montium dorſa a ſeptentrione verſus auſtrum tendere, &c. Extendi dorſa verſus auſtrum et boream indicio eſt, eoſdem ventos dominium tenuiſſe in oceano diluviano, qui jam in noſtro oceano." At the extremity of Finmark begins that ridge of high and rocky mountains called Koele, inhabited by the wandering Laplanders, who dwell ſometimes on the weſt-ſide of the ridge which belongs to Norway, and ſometimes on the eaſt-ſide which appertains to Sweden.† This ridge, which in its courſe goes by ſeveral names, according to the ſeveral places contiguous to it, ſeparates itſelf as it were into two arms, the firſt of which, in its progreſ-

* This is contrary to the other European chains of mountains, which in Hungary, Switzerland, France and Spain, &c. run eaſt and weſt. But the American Cordilleros, are in the ſame direction as our northern. Buffon's Nat. Hiſt. B. 1. Article 9.

† A [illegible] acquaintance, who when young was a miſſionary in Finmark, informs [illegible] that the Koele ridge in many places breaks into large vallies, and conſequently is [illegible] towards the ſouth, and that it ſeldom reaches above [illegible]

ſion, ſerves almoſt for a boundary betwixt the two aforementioned northern monarchies, and is called Rudfield, Sudefield, Skarsfield *, or more generally Sevebierg, or the Seven mountains The modern Swediſh hiſtorian, Olaus Dalin, in his hiſtory of Sweden, Tom. i p 11 ſpeaks thus of the progreſs of the chain, "it proceedes as it were under water from Gottenburg, to a promontory in Jutland, called the Skager Riff, and forms a bank, or mound, not ſo deep as the ſea about it, where is the beſt fiſhing in all thoſe parts" The other main arm of the Koelen chain, begins likewiſe to change its name in the dioceſe of Drontheim, where, at ſome diſtance, it likewiſe alters its poſition for the ſpace of ten Norway miles, firſt bending weſtward, as far as Roemſdal, and afterwards re-aſſuming its progreſs towards the ſouth, betwixt the dioceſes of Aggerſhuus, Bergen, and Chriſtianſand, and in the latter, about three Norway miles from Liſter, terminates in a prodigious precipice, the like of which is to be ſeen in very few parts of the world This arm, as has been obſerved, goes under different appellations, according to the adjacent countries, the firſt is Dofrefield, near Guldbrandſdall, then follow in order Lomsfield, Sognefield, Filefield, Halnefield, Hardangerfield, Joklefield, Byglefield, Hecklefield, and, laſtly, Langfield, which laſt is likewiſe a general appellation comprehending the whole chain, as far as Dofre, and is by ſome called only Langfieldene, i e the long mountains. This mountain it is which divides Norway into the diſtrict called Soendenfields, i e the ſouth mountains, comprehending the dioceſe of Aggerſhuus, and half that of Chriſtianſand, and the diſtrict called Nordenfields, i e the northern mountain, tho', with reſpect to its ſituation, it might as well be called Weſtenfields, i e Weſthill, conſiſting of the other half of the dioceſe of Chriſtianſand, and thoſe of Bergen and Drontheim The height and breadth of this extenſive chain are both very different, the mountain Hardanger being fourteen Norway miles over, whereas Filefield, computing from Laerdale, is ſcarce ten Dofrefield is accounted the higheſt mountain of this country, if not of all Europe Its perpendicular height indeed is not eaſily determinable, without calculating it by the

* Olaus Magnus, in Hiſt Sept Lib ii Cap xii ſays, that an entrance or paſſage through it to the rocks was here cut out by the labour and induſtry of man but this is very much doubted, and rather looked upon as S[illegible] de porta Eburnea, at leaſt it is what no Norwegian ever informed me of

Baro-

Barometer, for the levels on the ſide of the mountain, according to Peter Undahn's Deſcription of Norway, in one place reach eighteen Norway miles, and in another twelve, and the road is ſo winding, that in the winter-road, one meets no leſs than nine times with the river called Drivaae, which winds in a ſerpentine form along the ſide of the mountain The bridges acroſs this river make a dangerous appearance, as they are laid over roaring cataracts, or waterfalls, and but indifferently faſtened to the ſteep rocks, which deters the better ſort of travellers from chuſing this road, tho' the ſhorteſt The road over Filefield is the only one I am acquainted with from my own experience. This is a tedious aſcent, thro' many windings, from Laerdale to the ſummit of the mountain, of about ſix Norway miles and a half, which in a perpendicular height towards Laerdale, may be computed at half a Norway mile, or 9000 ells A proof, among others, of the great elevation of this mountain above the horizon of the champaign country, is the change from heat to cold, which within a few hours becomes ſo ſenſible, that the traveller may very well ſuppoſe himſelf ſuddenly tranſported from a hot ſummer to a piercing winter I croſſed it on the 28th of May 1749, having the day before, at my leaving Laerdale, obſerved the barley to be in ſome forwardneſs, and in the narrow vallies thereabouts, the heat was ſo ſultry that at noon I was obliged to ſhelter myſelf at Borgen chapel But after a few hours progreſs farther up the mountain of Filefield, I found myſelf riſing as it were into the upper region of the air, towards the pure and ſubtle æther, and as much in the depth of winter as if it had been new-year's day; ſurrounded with ſnow and ice, which were the more painful to the eyes, as having ſo lately enjoyed the pleaſing verdure of the fields and woods The ſun ſhone out very bright, but with ſo little heat, that tho' it was within three weeks of midſummer, all the waters, and particularly the freſh-water lake there, called Utreen, were frozen I was very deſirous of returning, being diffident of the aſſurances of my guides, that the ice would bear, for as the ſnow water lay upon it, I apprehended it might give way. However, I got over in my ſledge-chaiſe, which, as is here cuſtomary, was drawn by peaſants, and not by horſes

Another

Another proof of the great height of this mountain, is the extenſive proſpect from it, in clear weather; for from Soeltind, a rock ſtanding in the middle of the road, I had a view of the cataract of the river Bang, in Valders, a diſtance of about twelve Norway, or fifteen Daniſh miles, but on the other ſide my eye reached beyond Hallingdale, on the borders of Waas, conſequently the creſt of this mountain affords a proſpect of thirty Daniſh or German miles Another proof of the prodigious height of this mountain, is, that it cauſes a very ſenſible difference, in wind and weather, betwixt the north and ſouth ſide, of which I have already obſerved in another place, that the inhabitants on this ſide the mountain ſeldom have the ſame weather or air, as thoſe beyond it, the clouds, in ſtriking againſt the mountain, being repelled Hence alſo it is, that the winds, which in the dioceſe of Aggerſhuus cauſe fair weather, in that of Bergen bring rain, and ſo vice verſa.

The higheſt parts of this whole chain of mountains are every where ſo ſmooth and level, that if they were not conſtantly covered with ſnow, carriages might travel much eaſier than in the lower parts, eſpecially on the mountain near Hardanger, over which lies the road to Kongſberg, along which road large herds of cattle are driven, and great quantities of goods carried. But the utmoſt caution is neceſſary here, on account of the large chaſms in the ſnow, which hath lain there before the memory of man, and is conſolidated, theſe chaſms, in winter, are covered with looſe ſnow, and many perſons not being aware of them, have irrecoverably ſunk into an abyſs, from whence the only chance of an eſcape, is thro' holes made by the birds for their retreat*, therefore part of the mountain towards Quenherret, being frequented by fowlers and ſportſmen, is therefore called Fuglefang, i e the place for bird-catching Peter Undalin, in his Deſcription of Norway, p 75, ſays, that all travelling over this mountain is prohibited, except from the invention of the croſs, which is the third of May, to St Bartholomew Over Filefield, which is the poſt-road, and the road for the king's

* Such chaſms in the ſnow are alſo ſeen in the mountains of Switzerland "Il ſe trouve en divers endroits des montagnes de glace, &c Les allemans les appellent Gletſcher nous les appellons des glacieres, &c Il arrive quelques fois qu'elles ſe fendent de haut en bas, ce qui fait un bruit horrible Souvent la neige couvre tellement ces fentes que les voyageurs ne les decouvrant point y tombent et periſſent" Delices de la Suiſſe, Tom 1 p 23

carriages *, the way is marked all along with poſts, at two or three hundred paces diſtance, that in ſnowy or dark weather, the traveller may not loſe himſelf in theſe deſart wilds, where no living creature is to be met with, except here and there a few rain-deer, and which cannot be conſtantly inhabited, unleſs by Finlappers, who, as their dwelling is among the Koelen chain in Nordland, and Finmark, 100 miles farther north, may live very commodiouſly here In the valley called Smiddedal, there were formerly iron-works, but they have long ſince been diſcontinued, ſufficient quantities of iron-ore having been found in other more convenient places, for beſides the ſcarcity of birch and alder, the extreme cold, and the ſnow, with which the ground is covered nine months of the year, ſtunt the growth of trees.

Mount in ſtoves

In ſome meaſure to relieve and refreſh the traveller, two mountain-ſtoves, or reſting-houſes, are maintained on Filefield at the public charge, and three on Dofrefield, and furniſhed with fire, light, and kitchen utenſils There is but one way of avoiding this chain of mountains in the road from Sweden to Nordenfields, where it ſeems as it were interrupted by a long and deep valley, reaching from Romſdale to Guldbrandſdale; and this road many prefer in their journies from the highlands towards the ſea-coaſts, to Romſdale market with corn, butter, hides and furrs, which they barter for fiſh It was in their march through this long defile, that a body of 1000 Scotch, ſent over in 1612, as auxiliaries to the Swedes, were, together with Sinclair their commander, put to the ſword by the peaſants of Guldbrand, who never give quarter In theſe precipices and narrow paſſes conſiſt the beſt fortifications of Norway, and to them it was owing, that in the laſt war numbers of Swedes met with the ſame fate as thoſe Scotch, particularly, in the hollow-way near Krogkoven, where 200 men were cut off by lieutenant Cocheron, aſſiſted by the peaſants

* At a ſmall diſtance from the road is a chapel called St Thomas's, one of the Votive churches, as they are called, it having been an ancient cuſtom, in ſickneſs, or any other diſtreſs, to vow in offering there There is ſtill a ſermon once a year, on the Viſitation of the Bleſſed Virgin, which inſtitution poſſibly roſe from the hiſtory of this day, that Mary was gone early upon the mountain Some ſuperſtitious, tho' poſſibly well meaning people, reſort hither with their offerings, in diſcharge of their vows, whilſt oth is make the journey, as the miniſter complained, a pretence for carouſals, intrigues, and all manner of licentiouſneſs and diſorders

SECT

SECT V

Many leſſer ſingle mountains in all the provinces

To the other claſs of mountains, according to my former diviſion, belong thoſe which ſtand ſingle, and are diſperſed over the country, though they may in effect be conſidered as branches or ſhoots ſpringing from the extended roots of the chains These, likewiſe, are generally long in their form, and, like the others, ſtretch away from north to ſouth, but with fruitful vales betwixt them, watered with convenient rivers, by which the floats of timber are conveyed to the ſea-ſide for exportation The inhabitants find theſe little mountains much more convenient for dwelling, they being exceedingly fruitful, the ſides of them covered with fields and woods, whilſt their ſummits afford plenty of paſture for the cattle and wild beaſts, beſides which, their bowels are treaſuries of ſilver, copper, iron, and other metals, which, both here and in Sweden, are lodged in the ſmaller, and not in thoſe vaſt mountains; certainly a gracious diſpoſition of the Creator, to facilitate the labour of mining Tind and Gule in Tellemark, are ſaid to be the higheſt mountains in that part, called Soendenfields The dioceſe of Bergen, unqueſtionably, derives its name (which ſignifies hills) from the height and great number of this claſs of mountains, which are chiefly among the creeks, and on the ſea-coaſt, and of theſe Siken, Ulrich, and Lyderhoorn, are the higheſt in this dioceſe, though Meldiſk in Roſendale, Smoer-ſtak in Hougſgield, Alden, or the horſe in Sundfiord, Hornel in Nordfiord, Sneehorn and Skopſhorne on Sundmoer, Romdalſhorn, and others too many to be here enumerated, are more diſtinguiſhed by their height* The perpendicular height of theſe ſteep mountains, according to appearance, and the report of the people living near them, may be computed at betwixt 9 or 1200 yards, conſequently they are higher, than if ten common church-ſteeples were placed one over the other Strabo thinks the meaſure of the higheſt mountains in the whole world to be 30 ſtadia, Kircher, 43, Pliny extends it to 400, and Riccioli to 512, but M

* It is obſervable, that as many northern mountains are from their great height called Horn, ſome of the moſt diſtinguiſhed mountains in Switzerland bear the ſame appellation, as Schreckhorn, Wetterhorn Roſenſelhorn, Buchhorn, &c which ſhews mankind to agree univerſally in their images and metaphors, even where they have no communication with each other

Scheu-

Scheuchzer, in a particular tract, ſhews this meaſure to be vaſtly exaggerated

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The height of the higheſt mountains in Switzerland, which Julius Cæſar terms, ſummas alpes, is according to his conjecture, no more than 987 ells Floeyfield, in the neighbourhood of Bergen, which, however, I do not imagine to be half ſo high as Hornel or Sneehorn on Sundmore, was by a trigonometrical menſuration performed laſt winter, found to be 200 fathom, or 600 ells high, conſequently, Ulrich, which ſtands cloſe by it, cannot be leſs than 800 ells

Some of theſe mountains are peculiarly remarkable for their figure and appearance On the left hand, ſailing up Joering creek, one ſees ſuch a groupe of creſts of mountains, as reſembles the proſpect of a large city, with towers and old gothick edifices, and ſome of them being continually covered with ſnow, whilſt the chaſms in others make a way for the light to penetrate, the proſpect fills a ſtranger with aſtoniſhment Not far from thence, in the pariſh of Oerſkoug, is the mountain called Skopſhorn, of which the mariners and fiſhermen have a view at 16 leagues diſtance, when they have loſt ſight of the reſt On the higheſt creſt of this mountain, it has the appearance of a complete well-built fort, or old caſtle, with regular walls and baſtions It is an old tradition, that a girl who was attending a flock or herd, for a wager climbed up to the top, and according to agreement, there blew her horn, but was never ſeen after; upon which, her relations, according to an ancient ſuperſtition, imagined ſhe had fallen into the hands of the pretended ſubterraneous inhabitants of the mountains Perhaps the truth is, that the girl was not ſo fortunate in coming down as in getting up, and that ſhe fell into ſome cavity, where her body never could be diſcovered.

Near Alſtahoug, in the diſtrict of Helgeland, is a range of mountains of a very ſingular aſpect, having ſeven high pinnacles, or creſts, known by the appellation of the Seven Siſters, and which are diſcernible ſixteen miles off at ſea A friend of mine, who ventured to the top of the higheſt of theſe creſts, thinks their perpendicular height to be ſomething above a quarter of a league *

* The appears a very extraordinary height, for one of theſe ſeparate hills, which have always been accounted but ſmall in comparſon of thoſe of Dofre and Dale I have beſides been informed by ſeveral maritime perſons, that towards the north, the height of the mountains, immediately beyond Sundmoer and Nordmoer, decreaſes, as it increaſes after paſſing Stavanger, and approaching towards Bergen.

A View of the C Mountain of

the Seven Sisters near Ustaboug.

The Rock of Torg-Hatten in Norway

In the ſame diſtrict ſouthward is the noted mountain of Torghatten, ſo called from the likeneſs of its top to a man's head with the hat on, under which appears a ſingle eye, which is formed by an aperture, paſſable throughout, an hundred and fifty ells in height, and three thouſand in length, thro' which the ſun may be ſeen, it likewiſe affords a coarſe kind of agate, but which will admit of a poliſh On the top of this mountain is a piece of water, or a reſervoir, of the dimenſions of a moderate fiſh-pond The rain-water, which gathers there, trickles down the mountain thro' fiſſures and cracks on its ſide In the lower part of this mountain is alſo a cave, full of rugged windings A line of four hundred fathom, being tried out of curioſity, to meaſure this hiatus, did not reach the bottom; and it was thought too dangerous to proceed further. The mountain of Torghatten See plate III

SECT VI

Such ſecret paſſages, and wonderful caverns in the mountains, are far from being uncommon here. At Herroe in Sundmoer, I heard much talk, from the common people, of a cavern called Dolſteen, and, as they are apt to magnify all ſuch things by their own imaginations, they conceit that it reaches under the ſea, all along to Scotland. I deſired the two miniſters of the place perſonally to inform themſelves of the nature of it, and they accordingly ſent me the following written account Deep and long cavities and as it were ſecret paſſages in ſome mountains, and conjectures on the origin of them

"Purſuant to our promiſe of taking a view of the cavern in the mountain of Dolſteen, we went thither on the 16th of July 1750, its entrance was the height of a full-grown man, and it is two fathoms in breadth; but we immediately found it to increaſe in both dimenſions, even higher and wider than Herroe church. The ſides were perpendicular, like the wall of a houſe, riſing into a kind of vaulted roof It ſtretched itſelf S W and N. E till about the middle, where we met with a deſcent like the ſteps of ſtairs, and there it inclines more to the eaſt, but this deflection is not above three or four fathom long, when it again falls into its north-eaſt direction. On each ſide, at the bottom of theſe ſteps, was as it were a bank of clay, on which we reſted ourſelves, and at the end of theſe banks, likewiſe on each ſide, was a kind of door with an oval top, but upon viewing it with our Cavern in Dolſteen

lights, we found it to be but half an ell lower than the other part of the mountain Hitherto the height and breadth continued as before, but now it began to contract itſelf, and at the ſame time to deſcend lower There we could hear the daſhing of the waves, and the ſea was at leaſt an equal height with us, if not over our heads Soon after we came to ſome more ſteps, but being not inclined to venture further, we threw down a ſtone, and heard its echo for the ſpace of a minute, but whether it fell into the water, or on the dry rock, we could not diſtinguiſh Some conjecture may be formed of the length of this cavern, from our having burned two candles in our progreſs and return"

Another remarkable inſtance of a like ſecret paſſage in a mountain, I ſhall produce from my own experience Hearing at the pariſonage of Oerſkoug, that in the diſtrict of the annexed chapelry of Strande, not far from thence, a ſtream had been found, which iſſued through a rock from the ſide of a mountain called Limur, and over it a cavern which probably followed the ſtream, but of the length of which I could procure no account; I reſolved to examine it myſelf, as on my viſitation to Nordal I was to paſs near it I furniſhed myſelf with a tinder-box, candles, a lanthorn, and a long line to ſerve me inſtead of Ariadne's clue My boat put me aſhore at the foot of the aforeſaid mountain of Limur. But it being extremely ſteep, we were obliged to climb with our hands as well as feet, and ſometimes were hard put to it to clear our way through the hazle and alder-buſhes On the ſide of this laborious aſcent, we met with a rivulet, ſtreaming out, which directed us to the cavern It is indeed ſomething wonderful, being a kind of natural conduit, formed purely by the force of the water through the ſolid rock, which was a compound maſs, moſtly conſiſting of grey pebbles, but about the conduit, of a clear grey marble with bluiſh veins, had this natural ſtructure been raiſed by human ſkill, it would have been a work of no ſmall expence, for a few paces after getting through the thicket, which almoſt hides the aperture of the cavern, one is ſurprized with a vaulted paſſage of pure marble, without the leaſt flaw or breach, but with ſeveral angles and protuberances, all ſo poliſhed, as if it had been a paſte mouldered into ſmooth globular forms About a hundred paces forward, the paſſage continues in a ſtraight direction,

rection, then winds off to the right with aſcents and deſcents, and in ſome places growing narrower, and in others widening to double its former breadth, which, according to my admeaſurement, was about four or five ells, and the height about three, thus two perſons could go abreaſt, except that they were now and then obliged to ſtoop, and even creep, and then they felt a damp vapour like that of a burial-vault This prevented my penetrating ſo far as I had intended Another thing remarkable, was the terrible roaring of the waters under us, the courſe of which was what moſt excited my wonder, as over it lies a pavement of ſmooth ſtone, inclining a little like a vault on each ſide, but flat in the middle, and not above three fingers thick, with ſome ſmall crevices, through which the water may be ſeen If it be aſked how far this covered-way reaches? I make no queſtion but its length is equal to the courſe of the ſtream, and that it has been produced by the falling of the water, which in length of time, has perforated theſe rocks agreeably to the ancient maxim,

Gutta cavat lapidem, non vi, ſed ſæpe cadendo

And this is more particularly confirmed by the many projections which have been levelled, or undulated figures, which, as I have before obſerved, are to be ſeen on the roof, and along the ſides If it be aſked again, where is the ſpring of this ſtream? the peaſants hereabouts ſay, that on the uppermoſt ridges of the mountain, which is at leaſt a hundred fathom high, almoſt perpendicular above the cavern, there is a ſtanding-water of about a quarter of a league in circumference, and unqueſtionably formed and ſupplied by the frequent acceſſion of the rain, and the melted ſnow from the other parts of the mountain It is no difficult matter to judge how the uppermoſt dry vault comes to be of ſuch a height over the channel of the river, by which it is cauſed, for the cavity in its beginning could not have been ſo high, but by length of time, the ſtream, of which the upper vault was then the bed, penetrated to its preſent depth, and perforating the mountain, the particles which it detached, as ſand and gravel, ſettled on the ground, forming as it were a ſmall and level pavement, which is now a cover to that ſtream, of which it had been the bed I am the more confirmed in theſe thoughts, by a ſecond view I took of this

this cavern some days after, on my return from Nordal, when I ventured further in, though not so far as two men whom I had with me We then perceived, by the help of a lanthorn, through an aperture under our feet, that the stream had made itself another flat and smooth bed of little stones, or a gravelly bottom, like that under which it now runs, consequently in time, it will likewise penetrate through this new vault, which will then become its roof, and thus in another bottom, proceed to lay the foundations of another new vault:

Tantum ævi longinqua valet mutare vetustas

However easily those caverns, through which there is a water-course *, may be accounted for, yet it is more difficult to explain the origin of the many dry caverns and secret passages in the rocks, like that of Dolsteen, of which more instances might upon inquiry be found in other mountains The opinion that carries the greatest weight with me, is that of Woodward, in his Theory of the Earth, p 85, that the whole mass of terrestrial matter, after its dissolution by the deluge, and its subsequent reunion, was soon after, when dried and hardened, by some secret cause in the earth itself (a universal earthquake, or the like) again separated and thrown into such confusion, that the several strata, or layers, sunk in some places, and rose in others: this naturally gave the surface of the earth the appearance of a crackt or shattered building, with many chasms betwixt its ruins, till at length the earth shall be entirely levelled

SECT VII.

[illegible]

However true it be that this opinion of Woodward deserves the preference, beyond any of the conjectures of Burnet, Whiston, or other theorists on the effects of the deluge, yet it has not been exempt from opposition, and particularly is combated by Elias Camerarius, and but lately by Mr Buffon My reason for adopting it here, is, that of all others, it most facilitates the discovery of the origin, not only of the cavities, but of the mountains themselves He does not deny, as Burnet does, the existence of mountains and hills before the deluge, but is of opinion, that they

* Of this kind is that so remarkable cavern in the Peak in Derbyshire

were

were all diſſolved, and as it were liquified, and that the whole terreſtrial maſs, with its detached and intermingled parts, at laſt came to a coalition above the abyſs, in the form of a convex vault, one ſtratum above another, ſtone, earth, ſand, chalk, and other ſubſtances, ſubſiding quicker or ſlower, according to their ſpecific gravities, the ſeveral ſubſtances thus obtaining their collected ſtrata, the outward ſhell of the earth was ſmooth and level; and Burnet, in his Theory of the Earth, holds this to have been the ſtate of things from the creation to the flood, when the water broke up and demoliſhed the ſmooth ſhell, and this diſruption mingling different bodies, threw all things into their preſent diſorder, though the wiſdom of a divine œconomy be ſtill univerſally conſpicuous. Woodward, in anſwer to the queſtion, how the ſurface of the globe, which, according to his opinion, was rendered ſmooth by the deluge, fell into its preſent irregularity? how the middle or loweſt ſtrata were thrown uppermoſt, and ſuch a general confuſion prevailed? ſuppoſes, that immediately after the deluge, the abovementioned great change and diſſolution* took place, by which ſome detached ſtrata ſtood with one end in the air, and the other ſubmerged, that the place of the depreſſed was filled by the elevation of parts or fragments of different layers. Tho this be but an hypotheſis, yet it appears to me the only one, which accounts for and illuſtrates what I have moſt wondered at, in my ſpeculations on the ſtupendous ſtructure of our northern rocks, and particularly the ſtrata of their different parts. In theſe rocks, which are compoſed of maſſes very different in colour and figure, it is plainly ſeen that the ſubſtances thereof have been as it were liquified, and afterwards ſubſided ſtratum ſuper ſtratum, yet not always horizontal, according to the laws of motion and gravity, but rather in general, oblique, or in various, and in ſome places, even in perpendicular directions. The cauſe of this poſition cannot be cleared up without admitting the aforeſaid opinion of Woodward, at leaſt till ſome more rati-

* Several cauſes of this may be alledged but in my opinion this appears the moſt plauſible. As a new will, if the foundation gives way ever ſo little, cracks, and even ſticks and ſlits to ruin, the like muſt have happened ſoon after the flood, when this new mixture came to be dried, and this ſcarcity muſt occaſion crevices and apertures in the lower part, and conſequently in its upper ſurface, which neceſſarily followed the ſinking foundation, upon the water diſcharging itſelf from the other parts to the ocean.

onal solution shall be hit upon. What I most lament, is, that this learned and ingenious writer has not fulfilled his promise so often repeated, of demonstrating both the possibility and reality of his several hypotheses, and confirming them by experiments. He had for this end projected a large work, of which his Theory of the Earth was to be only introductory. The chief objection, which I could have wished to have seen answered by him, relates to the hard substance of stones, which he takes for granted to have been also dissolved and liquified.

Conjecture on the dissolution of the earth.

I ask, by what means this liquefaction was wrought at the time of the deluge? if recourse be had to the supposed central fire, from which the globe derives its levity, &c. and it be said that this by coction could dissolve the hardest quarries of marble, (the veins and streaks whereof sufficiently shew its former softness, and the loco-motion of its parts, not to mention the heterogeneous things found in it) then Noah and the animals in the ark must have suffered, unless we take the liberty of forming a new hypothesis, that this coction was not universal at once, but affected only a certain part of the globe, and certain tracts of its surface*: Strange and novel as it may appear, to assign such a vehement heat to the water of the deluge, yet this was a very ancient tradition, if we pay any regard to the words attributed to the devout Pionius, who suffered martyrdom in the year 250, under the emperor Decius, and among other things spoke thus to his unbelieving persecutors, "Ye yourselves, from your old traditions, acknowledge that the deluge of Noah, whom you call Deucalion, was *mingled with fire*, yet do you but half understand the real truth of this matter." Now though no great stress be to be laid thereon, yet is this conjecture far from being so improbable as that of Burnet, who makes the chaos of our globe to have been the remains or ashes of a consumed and vitrified comet, which by the creation, acquired a new life, form, and disposition †.

But

* Who knows whether any volcanoes existed before the deluge, especially, whether it did not previously accumulate vegetable and animal fragments from the resinous slime of the bottom of the sea, or at least great quantities of fuel, to the sulphur, coal, and other well inexhaustible ores already deposited there? Who at least will dispute the probability that the sea, [illegible] to the dreadful and incessant subterraneous fires, and volcanoes being [illegible] the [illegible] D. John Frederick Henkel's Pyritologia, Cap. [illegible] p. 265 seq.

† The [illegible] learned [illegible] Mr Buffon, in several parts of Tom. I of his Natural History, [illegible] with this hypothesis, but he differs very much from him.

But whenever this ſuſion happened, or whether the Almighty made uſe of it as a means or not, or whatever means he choſe for that end, for I do not concern myſelf with thoſe chimeras, yet nature and experience ſpeak ſufficiently plain to the point, and ſhew firſt * the poſſibility of it, no kind of ſtone whatever, whether pebble, marble, or flint, having ever been of ſuch a hardneſs, as not to be capable of being reſolved into its moſt minute particles, melted, liquified, and again vitrified, eſpecially by a good *burning-glaſs* †. In the next place, the reality of the matter appears beyond all doubt, to thoſe who have an opportunity of viewing the various figures and colours of the ſtones, in the rocks and mountains, ſome ignited, others ſtriated, and many heterogeneous bodies intermixed with them, of which Norway affords multitudes, eſpecially on the ſea-coaſt. If we conſider theſe attentively, they manifeſtly evidence, that anciently their matter was ſoft and liquid, but again indurated, and that after this induration, or petrification, they were in many places again detached and confounded, as if hewed through, broken, ſplit, and raiſed from their firſt horizontal ſtate to an oblique, and in ſome parts a perpendicular poſition. If the before-mentioned profound theoriſts had taken a view of this country, it would have furniſhed them, far beyond any other, with the ſtrongeſt experimental proofs and illuſtrations of their hypotheſes ‡. I ſhall, however, adduce ſome remarkable proofs from the heterogeneous ſolid bodies, ſo frequently found entombed as it were in other ſolid bodies,

Wonderful mixture in the mountains

him in the circumſtances. He turns our globe into a fluid or liquified matter, ſhorn from the ſun by a comet, which mixed itſelf with it. Could this have been expected from a man who treats all hypotheſes with the utmoſt contempt?

* Incendiis et inundationibus varie transformata fuit corpora, et quæ nunc opaca et ſicca cernimus, liquiſſe initio, mox aquis hauſta fuiſſe, tandemque ſecretis elementis in præſentem vultum emerſiſſe, credi par eſt. Omnis ex fuſione ſcoriæ vitri eſt genus, ſcoriæ autem aſſimilanda eſt cruſta, quæ fuſam globi materiam, velut in metallis furno, obtexit, induruitque poſt fuſionem.——Ipſa magna telluris oſſa, nudæque illæ rupes atque immortales ſilices, cum tota fere in vitrum abeant, quid niſi concreta ſunt ex fuſis olim corporibus, &c. Leibnitz Protogæa, § iii. p. 3, 4.

† Mr. Becher, in his Phyſic. Subterran. ſhews that the hardeſt ſtones are diſſoluble by water and fire. "Solius ignis et aquæ ope, ſpeciali experimento, duriſſimos quoſque lapides in mucorem reſolvo, qui deſtillatus ſubtilem ſpiritum exhibet." Again: "Eſt etiam certa methodus, ſolius aquæ communis ope, ſilices et arenam in liquorem viſcoſum, eundemque in ſal viride convertendi, et hoc in oleum rubicundum." This laſt method, which does not require the uſe of fire, is moſt agreeable to Woodward's Syſtem, which on that account, among others, appears the moſt eligible.

‡ That all ſtones were anciently a ſoft or ſlimy paſte, is admitted as a tried and unqueſtionable certainty, in the Memoires de l'Academie Royale, de A. 1716, p. 14.

I (ſolida

See plate IV. (ſolida intra ſolida) In the diſtrict of Evindvig, ſix leagues north of Bergen, is a place called Steneſund, where the mountain, for half a quarter of a league, abounds with ſuch petrified bodies, as are ſought for in the cabinets of vertuoſos, many kinds of Cornua Hammonis, large and ſmall ſnakes, muſcles, worms, inſects, and many others. This cannot be called a Luſus naturæ, which expreſſion, in this ſenſe, is rather a Luſus poeticus, and amounts only to a paltry evaſion, invented by perſons who are diſpoſed to deny what is undeniable. All theſe figures appear there as if they had been impreſſed into a paſte, or dough, and no rational inquirer can entertain any doubt, that the rock was as ſoft as dough, or paſte, when firſt theſe bodies were intermixed with it. I ſhall paſs over many leſſer examples of this kind, ſuch as St Olave's ſerpent in Nordal creek, which, as far as it concerns the ſaint, is fabulous, the monks having made uſe of it to attribute to St Olave the miracle of encountering this huge ſerpent, and throwing it up againſt the place where it is now ſeen, but that it has hung there ever ſince the deluge, is not incredible, unleſs its dimenſions of many fathoms render it ſo. But this doubt will likewiſe vaniſh, when I come in order, to ſpeak of the northern ſea-reptiles, and other extraordinary ſea-animals. In the quarry of marble near Muſterhuus, ſeven Norway miles ſouth of Bergen, in the ſurface of the rock, which is as it were the outward cruſt of the marble, or a porous ſtone, called Degſtein, we ſee ſeveral ſmall round holes, like thoſe obſervable in tallow, or in wax, when congealing after fuſion, and that the whole maſs of this quarry, together with its veins, were formerly in that ſtate, appears to me unqueſtionable from the anſwer of one of the workmen, when I aſked him, if he had never met in the marble with ſomething elſe, or ſome ſubſtance which had the appearance of a different ſubſtance? his anſwer was, "This happens very ſeldom, yet both myſelf, and others of my trade, have ſometimes met with it, and we have found in the middle of blocks of marble, ſnakes, muſcles, ſand, ſtone, and other ſuch things, ſo incloſed in on all ſides by the marble, as if they belonged to it, although they immediately looſen and drop out as a foreign ſubſtance. When this happens, it is uſually followed by ſuch a violent ſtench, as over-powers us, unleſs we turn immediately aſide from it." This laſt circumſtance I im-

The Mountain near Stone Yard

I impute to the long confinement of the air In my little collection of northern and other natural curiosities I have several such petrified pieces, which exhibit solidum in solido, and other indications of a sudden induration of these formerly fluid substances, by which fishes, worms, snakes, and other creatures have been inclosed in stones, as we meet with insects and the like in amber *.

Instead of dwelling on these things I shall corroborate the matter by a conjecture of my own, relating to three cavities in a rock in the district of Rake, three quarters of a Norway mile from Friedericshall These cavities at their entrance are round, and each not above two ells in circumference. Two of them are not very deep, and so are not particularly remarkable, as they might have been formed by human hands with instruments, but the third cavity, on that account, deserves the more admiration from the curious, for tho' not wider than the other two, and so smooth and regular, that it might be mistaken for a work of art, yet it would be absurd to suppose this, on account of its unfathomable depth, for when in order to form a computation of it, a small stone is dropped down, the echo does not in less than two minutes give any room to conclude that the stone has reached the bottom, and the sound it returns is quite melodious and pleasant, not unlike that of a bell This profound cavity, which is too narrow to receive a human body, much less to allow room for the motion of the hands, could not therefore possibly have been dug or bored by human art, consequently it must be of equal date with the world itself, or, which indeed is most probable, it was formed by the deluge, and possibly in this manner, the substance of the rocks being supposed soft and impressible like a paste, a round stone, previously indurated, might fall on it from some eminence, and by its own weight force a passage quite through And if the two other cavities, which are not very deep, proceeded from a similar cause, the stones which fell in there must have been lighter, or have met with a more inspissated or harder matter

* I am not little pleased that Mr Buffon has found the like, in other diverticulous bodies in marble and chalk Natural Hist Tom I Art VIII

SECT. VIII.

The origin of all mountains, rocks, and lesser stones, deduced from the premises.

This position being established, it opens a way to an easy explanation of the origin, both of the rocks, mountains, and hills, after the first plane had been formed by the deluge. The hills, of which few here are of such dimensions as to be classed among the mountains, might very easily be aggregated by the mere force of the water; but the rocky mountains being of a denser substance, seem to have been elevated from beneath, in a convex form, by a violent force of subterraneous wind, water, and fire, heaving them up, and scattering them about in so many protuberances *, and if this happened, before the substance of the stones became indurated and fixed, then the external wind did likewise, according to the conjecture before quoted, from M. Swedenburg's Observations, leave so many vestiges of its violence both in the extent and figure of them. This accounts, unquestionably, for the innumerable fissures, disruptions, and chasms, which appear like so many mountains sawn asunder, across or lengthways †. And hence many such apertures in the mountains are filled with a slimy matter, of a subsequent induration, and by the country-people called Hejertel. This projects in a range of about an ell, or half an ell in breadth, betwixt the other lapideous strata, and throughout the whole length or bulk of the mountain, which thus from the variety of its colours makes a very pleasing appearance. Of these Hejertels, or separate veins, some consist of marble, or alabaster, some of agate, and some of other white, red, blue, or brown kind of stones, which, especially towards the sea-coast, where the rocks are bare, form many curious variegations. Hence likewise remain on the surface the many detached blocks and

* Scio quosdam suspicari intumuisse aliquando terram ab erumpente spiritu, surrexisse montes ex planitie, erupisse insulas ex mari, qualis apud Cedrenum in historia miscella memoratur insula anno sub Leone Iconomacho.—Ego etiam facile admiserim initio, cum liquida esset massa globi terrae, inclusum spiritu superficiem varie intumuisse, unde illae mox induratae primaevae inaequalitates, neque etiam diffiteor, humanis licet rebus terrae motu aliquando vel ignivoma eructatione, monticulum factum. Leibnitz Protogaea, Sect. XXII. p. 36. seq.

† M. Buffon, Part I. p. 64, according to his system, assigns the following cause of the perpendicular fissures and chasms in the mountains, that the waters gradually subsiding, and the paste of the rocks being dried, the shafts thus contracted, necessarily separate, and leave an aperture betwixt them, as the like daily happens when mortar, starch, &c. harden. Whereas the horizontal rents in mountains, which are much fewer, run according to the several strata of the substances, which are observed to lie over each other, like the leaves of a book.

frag-

fragments, like lumps of mortar, or a ſoft paſte, ſcattered not only in the vallies and creeks, where they are called Sciſſars and Flies, but alſo on the tops of the higheſt mountains; many ſuch being found here of the bulk of a common houſe, conſequently too ponderous to have been raiſed to ſuch a height by the hands of men, and beſides of no viſible uſe.

Stones not vegetative

This likewiſe is the origin of moſt of thoſe pebbles, which are found ſcattered in all parts of the globe, and which by length of time become ſomewhat ſmooth and even. I ſay moſt of them, and allow that ſome ſandy ſtones may be ſaid to grow, and from this cauſe, that a ſuperficial layer of ſand or clay was indurated by the ſun But that ſtones in general, eſpecially the hard pebbles, grow, and conſequently are endued with a vegetative life, or internal power to imbibe their nouriſhment from the earth, this is certainly one of the moſt abſurd notions that ever was received among judicious men, and eſpecially in an age in which the cauſes of things are ſo minutely and accurately inveſtigated If after clearing a piece of ground of the ſmall ſtones, there appears to be a ſucceſſion of them, this is owing to a hard froſt within the earth, and the ſwelling of the earth by the enſuing thaws, whereby, every year, the ſtones are carried up to the ſurface. That mountain-cryſtals, and poſſibly more valuable gems, may grow like ſap or juices, which gradually become tinged with the colours of the minerals, and according to the quality and arrangement of the ſaline particles, concrete and ſhoot into cones, I am very willing to admit, likewiſe, that the water carrying away ſome lapideous particles, here and there in the cavities of the mountains, reduces them to a paſte, which afterwards being dropped, remains ſuſpended like icicles; and there forms what is therefore called the Drop-ſtone or Stalactites

SECT. IX

The [illegible] on [illegible] and [illegible] to Norway, from [illegible] and in our time.

Before I take my leave of the mountains, and particularly of our Norvegian rocks, I muſt, agreeably to my purpoſe, mention ſomething further to the praiſe of the great Creator, and to incline the people of Norway to be gratefully contented with the habitation which God has aſſigned them I previouſly grant, as all

all earthly enjoyments are mixed with bitters, according to the poet's ſaying,

> Omnis commoditas ſua fert incommoda ſecum,

ſo the inhabitants of a mountainous country may in general be ſaid to labour under more inconveniencies than others; as the country, in the firſt place, is leſs fruitful, the arable ground being but little in compariſon with the waſtes and deſerts. The diſproportion in many provinces, eſpecially thoſe which are entirely over-run with mountains, betwixt their produce and the inhabitants is very great, they being under a neceſſity of procuring one half of their ſuſtenance out of the ſea. In the next place, the villages cannot be ſo large, compact, and convenient as in other parts, but the houſes lie ſcattered among the vallies, generally at half or a quarter of a league diſtance, although up the country the farm-houſes are both larger, and ſtand thicker than in the vallies of Bergen, where they are the ſmaller, from the vaſt extent of the mountains. In ſome places, as in the creeks in Ulland and Nordal, the peaſants houſes ſtand ſo high, and on the edge of ſuch a ſteep precipice, that ladders are fixed to climb up to them, ſo that when a prieſt is ſent for, who is unpractiſed in the road, he riſks his life, and chiefly in winter when it is ſlippery. In ſuch places a corps muſt be let down with ropes, or be brought on men's backs, before it is laid in the coffin. The mail likewiſe in winter muſt, at ſome diſtance from Bergen, be drawn up over the ſteepeſt mountains. Under this head of inconveniences we may alſo reckon the very difficult roads, extremely ſo to the day-labourers, but particularly to travellers, who cannot without terror paſs ſeveral places even in the king's road, over the ſides of ſteep and craggy mountains, and on ways which are either ſhored up or ſuſpended by iron bolts faſtened in the mountains, and tho' not above the breadth of a foot-path, without any rails on the ſide, as indeed it is impoſſible to fix any, not to mention the ſudden riſing of the rivers, which they muſt either wade thro', or croſs over on ruinous bridges.* In this dioceſe the bridges are not

* In the narrow paſs of Næroe, leading to Woſs, is a very remarkable piece of antiquity, being a way ſuſpended on iron bolts, which the famous king Sverre, in the year 1200, or above ſix hundred years ago, cauſed to be faſtened into the rocks,

to

not built of any extraordinary ſtrength, being uſed only by foot-paſſengers, or horſemen, for there is no road for carts, and many peaſants here who have not ſo much as ſeen a cart, when they come to Bergen, look with amazement at it, as a curious machine A fourth evil reſulting from the mountains, and eſpecially in this province, is the ſhelter their cavities and clefts afford to wild beaſts of prey, which renders it difficult to extirpate them It is not eaſy to deſcribe what havock lynxes, foxes, bears, and eſpecially wolves, make among the cattle, the goats, hares, and other uſeful animals In the chapter of the wild beaſts we ſhall give a more particular account of this Another very pernicious evil is, that the cattle, goats, &c belonging to the peaſants, often fall down the precipices, and are deſtroyed Sometimes they make a falſe ſtep into a projection called a mountain-hammer, where they can neither aſcend nor deſcend, on this occaſion a peaſant cheerfully ventures his life for a ſheep or goat, and deſcending from the top of a mountain by a rope of ſome hundred fathom, he ſlings his body on a croſs-ſtick, till he can ſet his foot on the place where his goat is, when he faſtens it to the rope to be drawn up along with himſelf But the moſt amazing circumſtance is, that he runs this riſk with the help only of one ſingle perſon, who holds the end of the rope, or faſtens it to a ſtone, if there be one at hand There are inſtances of the aſſiſtant himſelf having been dragged down, and ſacrificing his life in fidelity to his friend, on which occaſion both have periſhed * The ſixth, and

to make a paſſage for his army, doubtleſs for his cavalry, which could not poſſibly have paſſed it, had they not been Norway horſes, there being accuſtomed to climb the rocks as nimbly as goats I add, that the moſt dangerous, tho' not the moſt difficult road I have met with in my ſeveral journies in Norway, is that betwixt Skogſtadt and Vang in Volders, along the freſh-water lake called Little Miös, the road on the ſide of the ſteep and high mountain, is in ſome places as narrow and confined as the narroweſt path, ſo if two travellers meeting in the night, do not ſee each other ſoon enough to ſtop where the road will ſuffer them to paſs, and chance to meet in the narroweſt parts, it appears to me as it does to others whom I have aſked, that they muſt ſtop ſhort, without being able to paſs by one another, or to find returning for their horſes, or even to alight The only reſource I can imagine in this difficulty, is, that one of them muſt endeavour to cling to ſome corner of this ſteep mountain, to be drawn up by a rope, if help be at hand, and then to throw his horſe down headlong into the lake, in order to make room for the other traveller to paſs

* Of theſe melancholy, and not infrequent accidents, of a man or a beaſt falling ſome hundred fathoms from the precipices, it is obſerved, that the air preſſes with ſuch force againſt the bodies thus falling, that they are not only ſuffocated and deprived of life long before they reach the ground, but their bellies burſt,

and not the least danger, to which the inhabitants in this and some other provinces, tho' seldom in Osterland, are exposed, is, that sometimes by a sudden disruption of a rock, great damages are done to the cattle, fields, and woods, and sometimes houses and families are involved in the destruction. These disruptions (called Steenskreed) generally happen in the spring, when the dilation of the strata of earth, occasioned by the thaws and rains on the summits of the mountains, loosens some adjacent small stones, which as they roll down, gradually gather more, and carry before them, or after them, such heaps of stones, sand and rubbish, that all the trees in the way are torn up, and the mountain is so stripped of all its covering, that it has the appearance of a beaten road, and if the earth chance to lie too deep for this mischief, many deep trenches, or long and narrow vallies are formed, the soil of which is thrown on the contiguous fields and pastures, which in time, tho' it requires some years, recover their verdure and fertility. The greatest and most destructive fall of stone as well as snow, of which I have elsewhere made mention, happened in this diocese about Candlemass, in the year 1679, when many cultivated tracts of land were destroyed, several houses demolished, and, only in the district of Sundmoer, 130 souls perished, and all this as suddenly as in other countries by earthquakes.

There is another much more terrible, and a more extraordinary natural accident, which in some degree resembles this last; it is distinguished by the name of Bergrap; the mountain being as it were convulsed, gives way, separates, and falls down on the country, sometimes in small pieces, and then the damage is but slight; but sometimes, tho' seldom, entire crests of rocks some hundred fathoms in length and breadth have fallen, which occasions a violent agitation in the air, and has all the appearance of a prelude of a general destruction of the world. The vestiges of such a Bergrap, are most evidently to be seen at Steen-broe, in Laerdale, in See plate

and their entrails immediately gush out, which is plainly the case, when they happen to fall into a creek, or any other water, for all the limbs remaining whole, but the belly is burst. The certainty of this matter throws a light upon an obscure passage, especially in Luther's and our Danish translation of the Bible, where it is said, Acts, chap. i. 18. *he hanged himself, and burst in two, and all his bowels fell out*. On the contrary, the words there, πρηνὴς γενόμενος ἐλάκησε μέσος, præceps factus est, *falling headlong, he burst asunder in the midst*, is the English translation, and agrees perfectly well with the sequel, according to the above observation, which in this country is but too often exemplified.

the

part 1

4 The Galleries a dangerous way

the gallery, as it is called, where a mass bigger than any castle in the whole world appears to have fallen from the rock, the pieces are, some of the bulk of a house, some less, but all as pointed as if millions of pieces of broken glass lay there The river roars prodigiously as it passes through these stupendous ruins, over which, however, a way has been laid with infinite labour, but certainly one more difficult is not to be met with throughout the world

When such a Bergrap falls into a creek, or any deep water, the fragments indeed are out of sight, but their submersion causes such an agitation of the water, as to overflow and carry away the adjacent houses, and even churches, of which, on the 8th of January 1731, there was a remarkable instance in the parish of Oerskoug, and in the annexed parish of Strand, on Sundmoer, where a mass, or promontory, called Rammersfield, hanging over Nordal-creek, being undermined by the water, suddenly fell down, whereby the water, for the space of two miles, swelled with such force, that the church of Strand (which has since been rebuilt on a higher spot) though a direct half league on the other side of the bank, was entirely overflowed, several barks carried up the country, many houses destroyed, and some people drowned, yet the creek was so far from being filled up, that the fishermen say, they find no difference in the bottom, which, thereabouts, is no less than 900 fathoms deep* And in the beginning of the present century, something similar happened to a mountain in Julster, which falling into a lake occasioned an inundation, whereby the neighbourhood sustained great damages

SECT X

From these inconveniencies and disasters to which Norway and all mountainous countries are exposed, I proceed, on the other Conveniencies and advantages arising from them to the inhabitants according to the Creator's wise and bountiful design

* Mr Hiort, superintendant at Sundmoer, in his letter to me of the 30th of November 1730 is of opinion, that this was chiefly occasioned by the deflexions of water from a spring on the summit of the rock, through its clefts and fissures and it being then a hard frost, these widened the clefts and forced them asunder I clos with this reason, and find it confirmed by Mr Rohault, Princip Traite Physique, Tom I chap xxiii p 201, "Si un corps dur a ses pores assez grands pour contenir beaucoup de liqueur, et si ces pores sont remplis d'eau, comme l'eau ne peut se geler sans se dilater, il peut arriver qu'en se gelant elle ecarte les corps qui la renferme"

hand,

hand, according to promiſe, to recite the advantages of mountains, and theſe alſo are very many, and ſome very conſiderable, ſo that the kind Creator has univerſally, in ſome things, compenſated the want of others, which he has thought fit to withhold from mankind

The firſt benefit of mountains is, that they collect the clouds and diſſolve them in rains, as I have already ſhewn, likewiſe that the maſſes of ſnow, reſervoirs, and ſprings in the mountains, ſend down large and ſmall currents of water, whereby the fields, woods, and cattle are refreſhed, and even the ſubterraneous veins of water and ſprings, which do not immediately iſſue from without the mountains, owe their origin to them, eſpecially where the veins are large and rapid, as has ſufficiently been made out by Ray, Scheuchzer, Wolff, and other naturaliſts I would only remark here, that ſeveral level heaths remain barren and uncultivated, merely becauſe, after digging deep for ſprings, men can ſcarce procure water ſufficient for their own uſe, and have no fodder for their cattle at all I am alſo of opinion that mountain-water is more fertilizing than common rain-water, and whether from ſaltpetre effluvia, or ſome other cauſe, has in it a particular vegetative power, as is manifeſt not only from the quickneſs of the growth, and vigor of all kinds of young trees, particularly pines, firs, oaks, and other trees on the ſides of mountains, where is very little earth, and ſometimes even in arid clefts, where they are known to thrive better than when planted in other parts, but the ſame is likewiſe viſible in the cultivated parts, which indeed are ſmall, but in ſuch fecundity, as both in ſtraw and grain greatly to ſurpaſs the champaign country, the marſh-lands and the like excepted It is alſo well known, that the ſurface of the hard mountains, tho' unfit for the plough, affords large and excellent paſturages, and the property of the northern peaſants in oxen, cows, ſheep, and goats, would be reduced very low, were it not for their ſpacious range on the ſides of the mountains, not to mention that wild-fowl, and beaſts, do as well as the ſeveral hurtful animals find more refuge and food in the mountains, than in the level country Beſides, the mountainous countries may be conſidered as the ſtore-houſes or treaſuries of providence, where are laid up, and from whence he kindly diſpenſes, according to the exigencies of the world in every

thoſe metals and minerals, which are become ſo indiſpenſable in human life, and the want of which, as a medium in commerce, obliges ſome nations to exchange their commodities for a ſmall bit of iron. Norway, ſtill a century and a half ago, appears from all accounts to have wrought but few mines, conſequently, the country contained treaſures out of knowledge. Since that time, matters are ſo improved by the aſſiſtance of German miners, that the ſilver, copper, and iron mines, have produced to the amount of ſeveral millions. Olaus Magnus, would be agreeably ſurpriſed, if he were a witneſs of the increaſe of mines, both in his native country, and here, beyond what he had ever imagined, for in his time he could ſay, "Montes excelſi ſunt, ſed pro majori parte ſteriles et aridi, in quibus nil aliud pro incolarum commoditate et conſervatione gignitur, quam inexhauſta pretioſorum metallorum ubertas, qua ſatis opulenti fertileſque ſunt in omnibus vitæ neceſſariis, forſitan et ſuperfluis alibunde, ſi libet, conquirendis, unanimique robore ac viribus, ubi vis contra hæc naturæ dona intentata fuerit, defendendis. Acre enim genus hominum eſt, &c." Olaus Magnus in Hiſt. Sept. Prol. Lib. v.

Theſe laſt words, which may confirm the opinion, that the inhabitants of Sweden and Norway derive their natural vigour and bravery, from the proximity of theſe rocky mountains, remind me of the third advantage to be conſidered here, namely, that the mountains afford a ſhelter and defence, not only againſt the inclemencies of the weather, but likewiſe againſt invaſions. They ſerve, as has already been ſaid, for boundaries betwixt Norway and Sweden, for from Kolen, a long chain of mountains, of an amazing height, ſeparates theſe two kingdoms. But the experience of all ages ſhews the many mountainous tracts in the country to be natural fortreſſes, for the Norway peaſants, who are excellent marksmen, poſt themſelves in time of war, on the ſteep inacceſſible rocks, where, animated purely by a zeal for their country, they gall the enemy incredibly. Some provinces are alſo by nature utterly inacceſſible to an army encumbered with artillery. On this account the city of Bergen, tho' fortified by no more than two caſtles towards the ſea, is thought to be in no great danger, if threatned only by a land-force, for the peaſants living in Juſtedale, and other places of the ſame kind, where the only paſſage is thro' a narrow defile, could, with a handful of men, keep

off a numerous army. Whether mountains be univerſally a natural girdle or band for ſtrengthening the compages of the globe, as ſome conceive, I leave abſolutely undetermined, it being immaterial to my purpoſe to adopt ſuch conceits for my own.*

Pleaſant landſcapes

Laſtly, theſe natural fortifications ſeem alſo to be an ornament and decoration to the country, the diverſified figures, and alternate eminences, and other varieties, according to the taſte of moſt people, form a much more agreeable landſcape than a flat and even country, which is almoſt every where the ſame. In this reſpect our country affords the moſt delightful contraſts in the diverſity of its proſpects. And theſe moſt magnificent ſtructures of the great architect of nature, raiſe and animate the mind of man, by inſpiring him with the moſt agreeable and the moſt ſublime ſentiments. Towards the extremities of the ſea-coaſt, thoſe who ſail along the bare rocks and towering mountains of Norway, will be apt to conclude, that the country can afford nothing but wretched cottages, and extreme penury; but this opinion ſoon vaniſhes upon their coming into the creeks, and obſerving that here, according to the German proverb, *there are people behind the mountains*, and that in the vallies and narrow interſtices they live very agreeably, amidſt ſuch delightful landſcapes, that within a few miles, a painter might have choice of incomparable originals. It is certain that nature has been more profuſely favourable to the ſituation of ſome farm-houſes, than to moſt royal palaces in other countries, tho' aſſiſted with all the embelliſhments of groves, terraſſes, caſcades, canals, and the like. Some trading places, as Bragneſs and others, are charmingly ſituated betwixt the mountains at the mouth of the rivers. A predeceſſor of mine is ſaid to have given the name of the northern Italy to the diſtrict of Waas, which lies ſome leagues eaſtward of Bergen; and certainly to one who deſires no more than a regular aſſemblage of the beauties of nature (tho' of mere nature) there cannot be a more enchanting proſpect; for all the buildings in it are Wang-church, the parſonage, and a few farm-houſes ſcattered on different eminences. But the beauty of the proſpect is much heightened by two uni-

* Quod oſſa in microcoſmo, hoc in geocoſmo montium ſtructura facit, qui totum terrenum globi molem [illegible] ſtringunt, ut [illegible] minime poſſit, atque hoc modo perfectam conſiſtentiam conſequatur. Athanaſ. Kircherus in Mundo Subterraneo, P. 1. pag. [illegible]

form mountains, gradually rising in the same proportions to a vast height, betwixt which runs a valley near half a league in breadth, and a river sometimes spreading into little lakes, and sometimes precipitating itself down the rocks, in foaming and sonorous cascades On both sides it is bordered with the finest meadows, intermingled with little thickets, and the easy declivities of the verdant mountains covered with fruitful fields, and farm-houses standing above each other in a succession of natural terrasses Between these a stately forest presents itself to the view, and beyond that, the summits of mountains covered with perpetual snow, and still beyond these, ten or twelve streams issuing from the snow-mountain, and forming an agreeable contrast in their meanders along the blooming sides of the mountain, till they lose themselves in the rivers beneath In other places, especially Osterland, and even beyond Drontheim, in North-land, in the districts of Salten and Semen, there are likewise very pleasant spots, besides other advantages, which the inhabitants reap from the mountains, of which, to avoid prolixity, I now take my leave But if any want further motives or informations on this head, to lead their meditations to God, as *the God of the mountains*, I refer them to the 17th chapter of Derham's Physico Theology.

CHAP

CHAP. III.

Of the WATERS.

SECT I.

The coaſts iſlands, and harbours of Norway

IN our ſurvey of the element of water, in and about Norway, the firſt object which preſents itſelf to us is a part of the north or large Atlantic ſea, which follows the coaſts of Norway for three hundred leagues, and by many narrow channels forms a multitude of ſmall and large iſlands, ſome of them being from three to ſix or nine leagues in length, and not barren, but moſt of them are ſo ſmall, that they are inhabited only by ſome fiſhermen and pilots, who keep a few heads of cattle, which they ſend out for paſture to the neareſt little iſlands, rocks, and Sheers By ſuch a rampart, which poſſibly may conſiſt of a million or more of ſtone columns, founded in the bottom of the ſea, the capitals whereof ſcarce riſe higher than ſome fathoms above the waves, almoſt the whole weſtern coaſt of Norway is defended, and thro' the providence of the wiſe Creator, there are many advantages which ariſe from them Among theſe the firſt is, ſecurity againſt any naval power of an enemy, whoſe ſhips, without a pilot from the country itſelf, would not dare to venture within the Sheers, and then they are in danger from the leaſt ſtorm, which hereabouts gives no warning, inſomuch, that in an inſtant, unleſs they have the good fortune of ſecuring themſelves in a good harbour, they may be daſhed to pieces in the creeks, which are all incloſed

with ſteep rocks. This coaſt, indeed, affords ſo many and ſuch good harbours as few other maritime countries can boaſt of; and this is another advantage of theſe numberleſs rocks and Sheers. Yet a large ſhip, which cannot make uſe of oars, will be in danger of not reaching the harbour, before the wind, or the current, which are very violent in the Straits, daſh it againſt the ſteep rocks in the neighbourhood. In order to prevent this danger, ſeveral hundreds of large iron rings, have, by order of the government, eſpecially here about Bergen, been fixed in the rocks more than two fathoms above water, as moorings to the ſhips, when there is not room for anchorage. The coaſters find the advantage of ſo many Sheers and rocks, as theſe protect them in a calm water, againſt the violence of the waves, which is greatly abated by breaking againſt the rocks. On the other hand, a few open places, ſuch as the harbour of the town, and that directly before Jeder, are ſo dangerous to paſs, that many lives are loſt there every year, the waves of the weſtern ocean, when driven by a ſtorm towards the land, making a very hollow and terrible entrance.

Bottom of ſea.

The bottom of the ſea is here, as every where, full of inequalities, and in this reſpect, not leſs varied than the land, which is frequently an alternate ſucceſſion of high mountains, and deep vallies. The analogy is the ſame in the ſubſtance of the bottom of the ſea, according to the obſervation of pilots, from the end of their leads, where they ſometimes find ſtones, ſometimes clay, chalk, mud, and ſometimes white or brown ſand, and in many places it is over-run, not only with all kinds of ſea-graſs, but with ſeveral ſorts of ſea-trees, ſome of which are pretty large, with corals, and the like ſtony vegetables.* A clear view of theſe, and likewiſe of the incredible multitude of ſea-animals, monſters, &c. moſt of them unknown, to which theſe vegetables partly ſerve as aliment, could not but excite in us the greateſt aſtoniſhment; for from the ſea-vegetables, which ſometimes hang at the lines, or other implements of the fiſhermen, and of which I have a large collection, we muſt conclude, that the bottom of

* Sylvas eſſe ſubmarinas mare rubrum ſ t ſuperque docet, ex cujus fundo ſubinde ingens a piſcatoribus corallinarum arborum copia, ccraſo noſtro vix cedentium uti ab Arabibus rubri maris accolis non ſemel audivi, eruitur. Kircherus Mund. Subterr. P. I. pag. 97.

the ſea, in its plains, mountains, and vallies, has foreſts of different kinds of trees, which, from the ſize of ſome branches which have been drawn up, may be conceived at leaſt equal to the largeſt fruit-trees in our gardens, but I reſerve my own obſervations upon theſe, till I come to treat in their order, of the Norway plants and vegetables

SECT II

Bottom of the ſea along the coaſt

The Norway ſhore is in very few places level, or gradually aſcending, but generally ſteep, angular, and impendent, ſo that cloſe to the rocks the ſea is a hundred, two hundred, nay, three hundred fathoms deep, whereas, on the long and uneven ſand-banks, which are generally called Storeg, or by others Haubroe, ſea-breaks, the bottom is much more ſloping Theſe protuberances run north and ſouth along the coaſt of Norway, like the Sheers, tho' not within them; in ſome places they are but four or ſix leagues, in others twelve or ſixteen from the continent, that from thence it may be concluded, that the bays are formed by them Theſe Storegs are another diſpoſition of the wiſe Creator, from the abundant fiſheries they afford, like the Dogger-bank betwixt Jutland and England, in a bottomleſs deep the fiſh would be out of reach, but here is as it were their daily rendezvous, and the depth being from ten to fifteen fathoms, they are taken with great eaſe

SECT III

Unfathomable depths even in the rivers and creek

From the ſea, particularly on the weſt-ſide of Norway, ſeveral large and ſmall creeks run ſix, eight, or ten leagues up the country, in theſe the bottom is found to be very different, tho' in general as deep as that of the ſea without, but as to the depth under water, the peaſants pretend, that the neareſt ſteep mountains are the meaſure by which to judge, they correſponding in their height above water, with the depth of the ſea Whether this rule be exactly right I ſhall not determine * This, however, is certain from general experience, that in the middle of theſe weſterly creeks, runs another narrow channel of a quite diſproportionate depth, which therefore is called Dybrende, i. e. the deep courſes, the breadth

* This is confirmed by experience in many other countries Danſke Voyages, P. II. p. 476

is from fifty to a hundred fathoms, but all the fiſhermen agree, that the depth is ſeldom leſs than four hundred fathoms, and they are very careful in ſpreading their nets, to caſt them as near this deep channel as poſſible, for the fiſh are caught in the greateſt plenty on its banks, it being as it were a place of their daily reſort, but herein they are obliged to uſe no leſs caution, that their nets be not carried into theſe depths, for the current, on account of its narrowneſs being very rapid, they are hardly recoverable, and, beſides, their line and nets will not ſuffice for a gulph of three or four hundred fathoms The depth of the water on both ſides of this channel, is commonly about an hundred fathoms, to which, if according to the above-mentioned rule, the height of the ſteep rocks on the ſides be added, tho' many of them are twice or three times higher, the whole ſpace from the creſt of the mountains to the bottom of theſe narrow depths, is at leaſt five hundred fathoms, or fifteen hundred ells This great depth appears to me very worthy of obſervation, to thoſe who would inveſtigate the effects of the general deluge, theſe deep creeks, and other deep vallies, being, as I conceive, formed by the ebb of the waters, in the ſubſtance of the rocks, which has been ſhewn to have been ſoft and impreſſible, as a paſte, or a maſs of mud, which gradually ſubſided and became a ſolid bottom to the waters, through which the large ſtreams and floods in their impetuous ebb muſt have made an inciſion, more or leſs deep, according to the height of the place from whence they iſſued. Now if it be conſidered, that the long chain of high and extenſive mountains, reaching, north and ſouth, the length of fifty Norway miles from the middle of the dioceſe of Chriſtianſand to Dofrefield, is about ſixteen Norway miles from the furtheſt ſea-coaſt, likewiſe that all the weſtern creeks run acroſs from the root of that chain into the ſea, we ſhall conclude, that the great depth of the creeks is little to be wondered at, the places, from whence the laſt waters fell, being of ſuch an enormous height, conſequently the many waterfalls, which gradually depreſſed the eminences, and the edges of the ſides of the mountains, muſt have been of extreme rapidity, and ſtrong enough to occaſion theſe deep channels The benefits of them are ſuch, that to them the dioceſe of Bergen may be ſaid to owe its being habitable, and the communication it enjoys

joys with the sea. For the many insurmountable rocks and precipices, the roots of which are penetrated by these navigable creeks, would else have rendered it impossible to dwell any where but on the sea-coasts, many tracts on this account being wild and uninhabited, in the mountains of Tyrol, and divers parts of this diocese, distinguished by the name of Uddale, i. e. inaccessible vallies, are, for want of communication with other countries, either without inhabitants, or they are destitute of conveniencies, tho' here and there in no want of fuel and pasture. Concerning this depth of the sea, I must further add, that in some places no bottom can be found, as in Floge creek, a Norway mile from Drontheim, where, after measuring it with a line of a thousand fathoms, the search proved fruitless, so that unquestionably the bottom of the sea has an opening or communication with this immeasurable abyss.

SECT. IV.

Weight of the sea water.

Altho' the sea-water, towards the north, contains less salt, than that near the line, as shall hereafter be shewed, yet its weight is much greater than in the warm countries, the cause of which is by Isaac Peyrere, in his letter concerning islands, to M. de la Mothe le Vayer, attributed to the aqueous particles, which are here more dense and impure than elsewhere. But as this creates another inquiry, he might more pertinently have said, that the air near the poles being condensed by the cold, compresses close whatever it touches, and consequently the particles of the water, and as by this compression they adhere closer to each other, consequently they have force to bear up heavy burdens, which in lighter waters would sink.

Rohault Traité de Physique Tom. 1. p. 111. cap. iii § 5.

SECT. V.

Its colour.

According to the observation of Mr. Urban Hiernes, the water of the north-sea is of a bluish tinge, as that near the Green Cape and Florida partakes of the colour of the sea-grass, which grows in great abundance thereabouts, near Vera Cruz it is white, from the chalky bottom, and near Maldivia it is as black as ink, probably by reason of the effluvia from the coal-mines, or some other black substance at the bottom. But that the water of the north-sea, has in itself a blue tinge does not appear, and I am

3 in-

inclined to believe that this blueneſs is no further real, than as the eye is apt to repreſent to itſelf the air, or any object at a great diſtance, of that colour. Peyrere, in the place before cited, affirms, that the ice in the north-ſea is blue, and therefore by the ancients termed Cerulea Glacies. The ſnow, which on the ſummits of the mountains gradually hardens into ice, is of this colour, and therefore commonly called Blaabreen.

SECT. VI.

Its ſoftneſs.

Altho' the ſea-waters of Norway be much ſalter than thoſe of the Baltic, where the ſea is refreſhed by abundance of rivers running into it, yet it has not the ſaltneſs of that in warmer countries, eſpecially under the torrid zone. And this is no more than natural; for where the vehement heat of the ſun occaſions a more copious evaporation and exhalation, as in the ſalt pans, there the ſaline particles in the remaining water become the more cloſely united, and conſequently the ſaltneſs of it more pungent, for that the ſun itſelf ſhould convey in its ſcorching rays innumerable atoms of ſalt to the ſea, and conſequently moſt there, where it ſtrikes the greateſt heat, is contrary to all experience, altho' the long ſince rejected principle of Ariſtotle * is again diſcuſſed and eſpouſed by that very ingenious and diligent naturaliſt in Sweden, Mr. Urban Hierne. It ſeems of more importance here to enquire, why the ſaltneſs of the ſea-water, here decreaſing towards the north, increaſes at ſome diſtance higher towards the north-pole, ſo that the water, no further than Iceland, is ſalter than the water on our Norway coaſts, according to M. Anderſon's remark in his Deſcription of Iceland? The cauſe is plainly this, that a very intenſe cold, ſublimates by evaporations greater quantities of the ſuperficial and freſheſt ſea-water, and partly diſſipates them by froſt. Thus here the cold has, tho' in a leſs degree, almoſt the ſame effect as the heat in hot countries, but this effect it cannot produce on the weſt-coaſt of Norway, where, for the moſt part we have damp weather, and know very little of the clear cold

Lowthorp Abridgm. vol. II. p. 297.

In the above mentioned work, p. 83.

* Je dirai ici en paſſant, que c'eſt une erreur d'aſſurer avec Ariſtote, que la ſalure de la mer depend de ce que les eaux ſont brulées par les rayons du ſoleil, car l'on n'a jamais experimenté que la chaleur de cet aſtre, ou même celle de la flamme ait converti de l'eau douce en de l'eau ſalée. Rohault Phyſique, Part. III. cap. IV. § et 3.

of winter, as I have ſhewn in the firſt chapter, together with the cauſes of it Further, that the ſea-ſalt diſſolves and detaches itſelf from the adjacent ſalt-grounds, and, partly, is carried thither by ſubterraneous currents, running thro' the deep ſalt-mines, of which kind ſome are to be found in Poland, and other parts, ſeems to me preferable to any other opinion, although the ſagacious Baron Wolfe cannot entirely come into it But what I alledge in anſwer to the queſtion, why the ſea-water does not continually grow ſalter, is this, that excluſive of the immenſe quantity of ſalt, which the ſea daily loſes by the many ſalt-works in France, Spain, and other countries, excluſive of the rain, and the freſh-water rivers diſcharging themſelves into the ſea, by which, according to the diſpoſition of the wiſe Creator, the balance is continually maintained, excluſive of all this, it is highly credible, that freſh-water ſprings iſſue out of the bottom of the ſea The poſſibility of this admits of no doubt, but to demonſtrate the reality by any experiment, will be attended with ſome difficulty, yet the fiſhermen living under Sund-moer, have more than once informed me, that they often find, in the body of a ſkate, water entirely freſh, which muſt always be ſuch, if this freſhneſs be the reſult of a kind of filtration, which the water has undergone within the body of the fiſh, but this freſhneſs not being common, I conclude that the fiſh has drank in this freſh-water from a ſpring breaking out in the bottom of the ſea It is obſervable, by the way, that the ſea-water on the coaſt of Norway, but moſtly on the weſt-ſide, is known to be pretty full of ſalt particles, the peaſants finding no ſmall quantities of ſalt in the clefts and apertures of the rocks, where, by the egreſs and regreſs of the water, ſome ſalt is left with the remaining ſurf, ſuch as might on occaſion be collected and purified In Hardanger, on Nord-moer, and ſeveral other places, particularly in the diocеſe of Drontheim, the peaſants extract ſalt from the ſea-water by boiling, but as this operation is forced, and conſumes great quantities of wood, therefore the law of Norway prohibits the boiling any more ſalt than is neceſſary to every one for his domeſtic uſes, without the expreſs permiſſion of the magiſtracy to make that uſe of the fuel About ten years ago, a large ſalt work was begun at Tonſberg on the king's account, and the ſea-water, after being firſt refined, is there boiled in ſuch quantities, that

Freſh ſprings in the bottom of the ſea

Salt ſea

ſeveral

everal ſhip-loads are annually exported, tho' this is but a ſmall matter in compariſon with ſixty, or more, fine large ſhips laden with ſalt, which come every year from Spain and France, for the fiſhery and other uſes.

SECT. VII.

Next to its ſaltneſs, the oil, or fatneſs, or unctuouſneſs of the north-ſea, is a remarkable property of it, eſpecially as the innumerable ſhoals of large and ſmall fiſh, which are both ingendered and nouriſhed there, ſerve both for food, and for the benefit of light, to almoſt all countries in Europe. For it is not merely by devouring one another that the fiſh are fattened, or by the aliment they receive from an infinite number of worms, and other inſects, likewiſe ſea-graſs, ſea-trees, and ſuch vegetables, which are the food appropriated to particular kinds of the inhabitants of the ſea, the ſalt-water itſelf, is from its ſaltneſs ſo fat and oily, that when a ſhip is on fire, the ſea-water, ſo far from extinguiſhing, encreaſes the flame. The Chemiſts know how to extract oil from ſalt, and Ariſtotle ſays, Quoniam mari ſuum pingue eſt, quod oleum demonſtrat quod in ſale eſt. Beſides this, in many places the bottom of the ſea is covered with a kind of unctuous loam, or ſlime, which, unqueſtionably, is formed from the ſuperfluous roes and ſpawn of the fiſh, which cannot all produce young, nor can they be all conſumed by the other fiſh whilſt they are freſh, altho' they hunt for it with the greateſt eagerneſs. It is moreover not improbable, that ſmall ſprings or currents of rock-oil, naphtha, ſulphur, or pinguous effluvia of coals, and other ſlimy and oleaginous juices, may ariſe in the ſea as well as the earth.

The ſea water oily.

Ariſt. Probl. § xxiii. Qu. 32.

SECT. VIII.

This unctuouſneſs of the ſea has probably ſome connection with its effulgence and ſcintillations, when the water being ſtirred by rowing, or otherwiſe, appears all on fire, which by our mariners is called Moorild. I have already in the firſt chapter, in treating of the Aurora Borealis, or north-light, taken occaſion to quote Captain Heitman's opinion concerning this phænomenon, and ſhall only obſerve here, that Mr. Urban Hierne, the Swediſh naturaliſt, who in a paſſage before cited, derives the ſea-ſalt from the ſun, judges

Noct[illegible] coruſcations and effulgence of the ſea.

judges this ſea-light to be a kind of phoſphorus, formed from the luminous particles of the ſun, and even of the moon, impregnated by water, as is the caſe in the Lapis Bononienſis, and Baldwin's phoſphorus But inſtead of reſting in theſe, or other conjectures, I am much more inclined to declare my opinion, that this otherwiſe inexplicable phænomenon in the ſea, has been beſt illuſtrated (tho' with room for many additions) by a little piece lately publiſhed at Venice, with the title of Nuovo Scoperto Intorno di luci Notturne dell' Aqua Marina Having no opportunity of ſeeing the original, I am the more obliged to the diligent and ingenious authors of the New Copenhagen Literary Journal, who have given us the ſubſtance of it in the xxxixth part, of the 24th of Sept 1750, in the following words, " Our author is the firſt who has explained the true cauſe of this coruſcation He has obſerved, that in the gulph of Venice, the water is luminous only from the beginning of ſummer till the end of harveſt, and that this light is moſt copious in places abounding with ſea-graſs, and ſtill more when the water is put in motion, either by the winds, ſhips, or oars In 1746, the author filled a flaſk with this ſcintillating water, and carried it home, but it emitted no light, except only when ſtirred in the dark, it immediately ſparkled He cloſely inſpected it in the day-time, in order to diſcern whether the water had any thing heterogeneous in it, from whence theſe emanations of light proceeded, but nothing of this kind appeared to the naked eye he therefore ſtrained the water through a cloſe fine cloth, the conſequence of which was, that the cloth ſhone in the dark, but not the water, however ſhaken or ſtirred This inclined him to judge, that the lucid ſubſtance in the water was ſomething diſtinct from the water itſelf, eſpecially as he perceived the light, which the cloth emitted, to conſiſt of innumerable lucid particles or points, but not having a microſcope at hand, he could take no minute view of them Having ſome time after procured a microſcope, he gathered ſome ſea-graſs, which is moſt apt to glitter in the night, and upon examining it in a dark place, he diſcerned above thirty of theſe lucid particles on one ſingle leaf He ſhook this graſs over a ſheet of paper, when one of theſe particles fell off, it was as ſubtile as an eye-liſh, and about as long, and the colour a black yellow he now made uſe of the microſcope,

ſcope, and plainly ſaw it to be a living worm, or annular maggot, conſiſting of eleven wings, like moſt of the larvæ, with as many mamillæ on the ſides inſtead of feet, and both at the head and rump, four trunks or feelers (antennæ or tentacula) In the proſecution of his reſearches, he found that all theſe lucid appearances in the water, aroſe from theſe minute and almoſt inviſible maggots, their whole bodies were lucid, and not ſome particular part only, which is the caſe of ſome kinds of reptiles, tho', when at reſt, their effulgence was conſiderably fainter In ſpring theſe luminous animalcula confine themſelves to the ſea-graſs, but in ſummer they are diſperſed all over the ſea, and moſtly on the ſurface When theſe nocturnal ſcintillations are unuſually ſtrong and frequent, the fiſhermen account it a ſure prognoſtic of a ſtorm, or foul weather, and this proceeds from the greater agitation of the worms, already ſenſible of the approaching changes This experiment puts it beyond all queſtion, that the glittering of the ſea, in a ſhip's courſe, is occaſioned by theſe worms, and it is no leſs certain, that they are the cauſe of the light in the Penna-marina, (a large muſcle) of which Dr Shaw writes, that they are frequently caught by the Algerine fiſhermen, and in the night their radiations are ſo ſtrong, that the fiſh neareſt to them in the net are diſcernible without any other light It were to be wiſhed, that the author had been more preciſe in his deſcription of theſe animalcula; if his eyes may be relied on, one cannot but judge, that they are only a ſpecies of the Genus Aphroditæ" Thus far this author; to which all my preſent addition ſhall be this, the Ignes lambentes, or lambent flames, ſo well known, which by their hovering about the ſhips rigging, and often ſettling on the maſts, tho' without doing any damage, ſtrike a terror into the ſeamen, and likewiſe thoſe Ignes fatui, or jack-a-lanthorns, which deceive the traveller by land, muſt, according to this principle, be no more than worms, bred in the above-mentioned ſulphureous oil, with which both land and ſea is filled, but which is too ſubtile to be diſcerned by day, when even the light of the ſtars is ſeemingly inviſible.

SECT IX

Motion of the sea by currents, ebb and flood

My ſubject brings me at laſt to the ſeveral motions of the water in Norway, by the ebb and flood, and by other perpetual currents, the motion of the ſea by winds, or by the impulſe of the corpuſcles of the air, having already in ſome meaſure been conſidered in the firſt chapter The motion of the ſea is generally from eaſt to weſt, tho' it be not always apparently ſo to us; for the earth revolving round its axis with a conſtant rapidity, and in an oppoſite direction from weſt to eaſt, and the water as a more lax element, not being capable of equal velocity, but ſomewhat ſlower in its progreſſion, the ſurface thereof ſeems to be in a contrary and retrograde motion. The motion of the water is in ſome meaſure influenced by the ſun, but not to ſuch a degree here as in the warmer countries, where its rays being more perpendicular, act with the greater force *

Another motion in the ſea is interrupted, and mixes with the general ſtream, occaſioning the water alternately to riſe and fall within the twenty-four hours, when the flood proceeds from the eaſt, and the ebb from the weſt, and theſe alternatives fall out regularly according to the courſe of the moon, ſo that they are very little varied by the ſhifting of the winds The greateſt height of the flood here is eight feet, but much more uſually from four to ſix, which is far ſhort of the height in the Netherlands, and England, the water being checked in the ſtrait betwixt Calais and Dover, but having more room to extend itſelf in the north-ſea†. That this motion, in other reſpects one of the greateſt myſteries in nature, is, as to its original cauſe dependent on the moon, cannot well be controverted But whence this influence of the celeſtial bodies on the waters of our globe, whether, according to the ſentiment of the ancients, the rays of the moon leave the ſea im-

Hartſ Conj Phyſiq l. i. Obſ. 1 p. 5-

* The current in ſome places is remarkably ſtrong and impetuous, as where it is extremely ſtraitened and confined at the bottom by ledges of ſheers, rocks, or ſand banks at a ſmall diſtance from the ſhore, and being thus contracted into a narrow channel, is ſo difficult to ſtem, that a boat muſt either be drawn along by hands on ſhore or wait ſome time till the current abates

† Mr Lucas Debes, in his deſcription of the iſland of Faro, relates ſomething ſtrange of a freſh-water-lake near Famoye, a town on a hill of a middling height, that it regularly keeps time with the ebbing and flowing of the ſea As the impreſſion of the moon upon our atmoſphere cannot be ſtronger on this freſh lake than on others, this muſt be ſuppoſed to have a ſubterraneous communication with the ſea, through ſome vaſt and extraordinary hiatus

preg-

pregnated with an intumeſcent or fermenting power, by which it begins to work alternately, with different forces, like new liquor in a caſk, or whether Deſcartes comes nearer the truth, in advancing, that it is only the atmoſphere of the moon, which makes an impreſſion on all ſublunary bodies (of which patients in certain diſeaſes have very ſenſible experience) but moſt on the ſea, where, accordingly the impreſſion is moſt obſervable this muſt, as it has hitherto been, remain a difficult problem *, even to our inquiſitive age. And, indeed, there is no abſolute neceſſity that our great Maſter ſhould in this life admit us, as his ſcholars, and the moſt knowing are but novices, into all the arrangements and operations of his almighty power and inſcrutable wiſdom I rather think it were beſt to reſt in a devout admiration of theſe things, than to ſubject them to an arrogant and preſumptuous deciſion.

SECT. X.

The Moſkoe ſtrom not what it is taken for at a diſtance

There is another kind of current, or motion of the water in the ſea of Norway, remarkable, and ſomewhat relative to the ebb and flood, namely the Maleſtrom, or Moſkoeſtrom, in the 68th degree, in the province of Nordland, and the diſtrict of Lofoden, and near the iſland Moſkoe, from which the current takes its name Its violence and roarings exceed thoſe of a cataract, being

* "Le fluide peſant et elaſtique, dont nôtre terre eſt environnée, doit comme tous les liquides, s'elever ou s'abaiſſer dans les endroits, où des cauſes etrangeres detruiſſent l'equilibre, d'ou viennent, dans les tems reglés, des changement dans la preſſion de l'air Le flux et reflux admiré de tout tems, mais inexplicable avant Newton nous fournit la reſolution de ce probleme Nous voyons cette grande maſſe d'eau s'elever deux fois toutes les vingt-quatre heures, dans le tems que la lune eſt ou directement au deſſus de nous, ou dans le point oppoſé Notre air, par la meme raiſon, et dans le meme tems doit auſſi changer ſa figure ſpherique en celle d'un ſpheroide allongé dont le grand diametre paſſe par la lune Le ſolail, qui de meme qu'elle traverſe tous les jours deux fois, notre meridien, produiroit le meme effet, ſi la diſtance plus grande ne mettoit entre ſon action et celle de la lune le rapport de 1 a 4 ½ Le concours de ces deux aſtres dans les tems de la pleine et de la nouvelle lune augmente les elevations de la mer, et doit augmenter de meme les marées inviſibles de l'air, et elles doivent etre plus petites dans les quadratures, lorſque les actions des deux luminaires ſont oppoſees entre elles Elles ſont d'ailleurs proportionées à leur diſtance plus ou moins grande de la terre Et les declinaiſons de la lune dans de certains lieux rendent tous les jours l'une des deux marées, tant dans l'airque dans la mer plus grande que l'autre" Biblioth Raiſonnee de l'an 1746, T xxxvii p 299, 300 This extract from Dr Mead's treatiſe, De Imperio Solis ac Lunæ in Corpora Humana, &c is the moſt appoſite of any, and I can confirm it by the inſtance of a lady but lately dead at Bergen, the calves of whoſe legs, in the time of her pregnancy, ſo punctually ſwelled and abated with the efflux and reflux of the ſea, that the time of tide could be determined without looking towards the ſea

heard

heard to a great diſtance, and without any intermiſſion, except a quarter every ſixth hour, that is, at the turn of high and low water, when its impetuoſity ſeems at a ſtand, which ſhort interval is the only time the fiſhermen can venture in: but this motion ſoon returns, and, however calm the ſea may be, gradually increaſes with ſuch a draught and vortex as abſorb whatever comes within their ſphere of action, and keep it under water for ſome hours, when the fragments, ſhivered by the rocks, appear again. This circumſtance, among others, makes ſtrongly against Kircher and others, who imagine that there is here an abyſs penetrating the globe, and iſſuing in ſome very remote parts, which Kircher is ſo particular as to aſſign, for he names the gulf of Bothnia. But after the moſt exact reſearches which the circumſtances will admit, this is but a conjecture without foundation, for this and three other vortices among the Ferroe iſlands, but ſmaller, have no other cauſe, than the colliſion of waves riſing and falling, at the flux and reflux, againſt a ridge of rocks and ſhelves, which confine the water ſo that it precipitates itſelf like a cataract, and thus the higher the flood riſes, the deeper muſt the fall be, and the natural reſult of this is a whirlpool, or vortex, the prodigious ſuction whereof, is ſufficiently known by leſſer experiments. But what has been thus abſorbed, remains no longer at the bottom than the ebb laſts, for the ſuction then ceaſes, and the flood removes all attraction, and permits whatever had been ſunk, to make its appearance again. Of the ſituation of this amazing Moſkoeſtrom we have the following account from Mr. Jonas Ramus, "The mountain of Helſeggen, in Lofoden, lies a league from the iſland Ver, and betwixt theſe two, runs that large and dreadful ſtream called Moſkoeſtrom, from the iſland Moſkoe, which is in the middle of it, together with ſeveral circumjacent iſles, as Ambaaren, half a quarter of a league northward, Iſleſen, Hoeyholm, Kieldholm, Suarven, and Buckholm. Moſkoe lies about half a quarter of a mile ſouth of the iſland of Ver, and betwixt them theſe ſmall iſlands, Otterholm, Flimen, Sandfleſen, Skarholm. Betwixt Lofoden and Moſkoe, the depth of the water is between thirty-ſix and forty fathoms, but on the other ſide, towards Ver, the depth decreaſes ſo as not to afford a convenient paſſage for a veſſel, without the riſk of ſplitting

In Mundo Subterr. C. x. Lib. iii. p.

Nordiſh Chorograph. p. 233, 234.

ting on the rocks, which happens even in the calmeſt weather when it is flood, the ſtream runs up the country betwixt Lofoden and Moſkoe, with a boiſterous rapidity, but the roar of its impetuous ebb to the ſea, is ſcarce equalled by the loudeſt and moſt dreadful cataracts, the noiſe being heard ſeveral leagues off, and the vortices or pits are of ſuch an extent and depth, that if a ſhip comes within its attraction, it is inevitably abſorbed and carried down to the bottom, and there beat to pieces againſt the rocks, and when the water relaxes, the fragments thereof are thrown up again But theſe intervals of tranquillity are only at the turn of the ebb and flood, in calm weather, and laſt but a quarter of an hour, its violence gradually returning When the ſtream is moſt boiſterous, and its fury heightened by a ſtorm, it is dangerous to come within a Norway mile of it, boats, ſhips, and yatchs having been carried away, by not guarding againſt it before they were within its reach It likewiſe happens frequently, that whales come too near the ſtream, and are overpowered by its violence, and then it is impoſſible to deſcribe their howlings and bellowings in their fruitleſs ſtruggles to diſengage themſelves A bear once attempting to ſwim from Lofoden to Moſkoe, with a deſign of preying upon the ſheep at paſture in the iſland, afforded the like ſpectacle to the people, the ſtream caught him, and bore him down, whilſt he roared terribly, ſo as to be heard on ſhore Large ſtocks of firs and pine-trees, after being abſorbed by the current, riſe again, broken and torn to ſuch a degree, as if briſtles grew on them. This plainly ſhews the bottom to conſiſt of craggy rocks, among which they are whirled to and fro This ſtream is regulated by the flux and reflux of the ſea, it being conſtantly high and low water every ſix hours In the year 1645, early in the morning of Sexageſima-Sunday, it raged with ſuch noiſe and impetuoſity, that on the iſland of Moſkoe, the very ſtones of the houſes fell to the ground" So far Mr Ramus, whoſe account perfectly agrees with thoſe given me by others, eſpecially Mr J Althand of Ethne, who in his younger years was chaplain there, and conſequently had many opportunities of obſerving variety of circumſtances Mr Peder Daſs, who lives on the very ſpot, will admit of no other cauſe of this natural prodigy, and in contradiction to the opinion of the Daniſh poet Arreboe, in his ſtanzas on ſubterraneous watery abyſſes, he

affirms this vortex to arise only from the violence and rapidity of the daily ebb and flood, occasioned by the contraction of its course betwixt the rocks, whereby, in calm weather, but much more when the sea is rouzed by the wind, this Moskoestrom is rendered so dangerous and dreadful, both on account of its sound, and the furious agitation of its mountainous waves

The like vortices in Ferroe Ferroe Resignata cap 1 P 45

For the illustration of this strange phænomenon, I shall add a description of three vortices, equally rapid, but not bottomless, here in the north-sea, near the island of Ferroe What the late Rev Mr Lucas Debes, superintendant there writes of them, deserves to be read in his own words "In Ferro are three whirlpools, one betwixt the islands of Videi, Suine, and Bord, but here is no great danger · the second is off the island of Sand, near Dalsflaes, it is distinguished by the appellation Quærne, i. e mill-wheel, and in blowing weather, or a high tide, is dangerous; but the greatest danger lies in the third, which is southward of the Suder island, and runs round Sumboe-munk These, and the like whirlpools, are not occasioned by any extraordinary abyss, or subterraneous cavities, into which the water is violently attracted in the time of ebb, and again ejected at the time of flood; as some imagine the flux and reflux, over the whole ocean, to result from the like causes, for if this were the case, it would not be attended with such a terrible sound, a deep bottom making a still water; but the real cause lies in the convexity of the bottom, intersected with canals or trenches

I have made the most diligent research into these whirlpools, having been sent from Ferroe with two persons, deputed with public powers, to negociate some provincial matters, and, on this occasion, one of them, John Joensen, an inhabitant of Suderoe, informed me, that he was the first, who ventured in a row-boat on the southern whirlpool, which runs from Suderoe round Sumboe-munk, and from his own certain and long experience, gave me the following account This stream, is in itself very dreadful and dangerous, especially in a storm or strong tide, it absorbs every thing near it, and immediately plunges it to the bottom, insomuch that a large ship, within its draught, is infallibly swallowed up It is but a few years since the above-mentioned John Joensen, about Christmas, saw a large ship driven into this stream by a storm,

first

firſt it mounted with its prow foremoſt, then was reverted with its ſtern uppermoſt, the ſurf flying over the maſt head, but in a very ſhort time he ſaw no more of it That expert navigator Bagge Vandel, makes mention of this vortex, adding in particular concerning Peter Oddevald, maſter of a veſſel, that both he and the ſhip's company informed him, that the ſhip was toſſed about in it before he had any ſenſe of the danger, and inſtantly he loſt all power of ſteering her, that the water broke on all ſides into the ſhip, flying up to the maſt head, that the ſails were of no ſervice to extricate him, the weather being quite calm To which the maſter added, that he had never before been in any danger like it; but that at laſt God was pleaſed to help him, and that by the turn of the tide he got without the draught, and arrived ſafely at Thorſhaven, the place of his deſtination

But, according to the report of the ſaid John Joenſen, the bottom, near this vortex, lies about eighty or ninety fathoms deep, over which the ſtream runs ſmooth and ſilent; after this is another circle, compaſſing the vortex, at the depth of from twenty-five to thirty, or thirty-five fathoms, and here the ſea, fermented by the ſtream, begins to be agitated, to attract, and whirl round; afterwards the bottom riſes ſo as to be but eight, ten, or twelve fathoms deep, and riſes in a winding circle, which increaſes gradually in four ſpiral windings: on this ſhallow ground, are likewiſe protuberances like the creſts on mountains, not more than eight fathoms deep from the ſurface of the water, whereas, the ſpace between is from ten to twelve fathoms deep; and hence it is, that fiſhing-boats which come into this unequal bottom, are, by the ſtream circulating round theſe rocks, whirled about like a mill-ſtone, with ſuch rapidity, that young perſons who are not uſed to the whirling, grow giddy, and lay themſelves down in the bottom of the boat, and beſides this motion, the boat likewiſe undergoes a rotation round the large ſpiral circle, formed by the nature of the bottom

In the third place, there are betwixt theſe four ſpiral ſhallows, three canals, or trenches, where the ſea moves gently round in ſmall circles, and beyond them, eaſtward, where the ſhallows commence, is a draught like a ſluice, thro' which the ſtream is carried, tho', within, its force and agitations are not ſo violent

The depth of theſe canals is from twenty-five to thirty and thirty-five fathoms, and from the diſparity of the depths, and the eaſy whirling of the water in them, the bottom appears to reſemble the land, that is, to conſiſt of eminences and vallies

Fourthly, in the middle of this vortex is a deep pit, which on its banks meaſures from fifty to fifty-eight fathoms deep, but in its middle is generally not leſs than ſixty-one This innermoſt water is on its ſurface perfectly calm and ſmooth, only moving in a gentle circle, as is manifeſt from the foam of the ſea, which, on its devolution from the vortex, moves in a circle On the ſouth ſide of this pit, a rock, ten fathom high, riſes out of the water, it is called Sumboe-munk, and here the depth of the water is but fifteen fathoms North of this rock lie ſix ſheers, betwixt which, and the rock, the depth of water is three or four fathoms And what is very remarkable (and which I have accordingly taken notice of elſewhere) among theſe ſheers the compaſs turns round, in the manner of the vortex, and is ſpoilt by the motion Likewiſe, at ſome height on Sumboe-munk, there is this ſingularity, that in the midſt of ſummer, and in a ſtrong ſunſhine, the people who go thither to catch birds, can hardly ſtand in their ambuſcades for cold, beſides, the very birds which breed and live there, are ſo extremely bare of fleſh, that their whole ſubſtance is little more than their feathers, but of the cauſe of this ſingular cold, I can only form uncertain conjectures. The water about Ferroe, however eſſentially cold, yet by its ſaltneſs and agitation, uſually attemperates the winter's ſeverity in Ferroe, I cannot therefore comprehend, how the frequent agitations of this ſtream againſt the rock, ſhould by an effect quite oppoſite, occaſion ſuch an extraordinary cold It might, by way of a ſolution, be ſaid, that there being a magnetic power in theſe ſheers, as the centre of theſe round ſhallows, there muſt in the other round ſhallows be a ſtrong magnet, which, beſides the force of the current, rapidly draws large ſhips from their courſe, and if it be granted, that ſuch magnets are there, then I ſubmit it to the judgment of others, whether the cauſe of this ſingular cold is to be ſought for in theſe magnetic powers

Fifthly, north of the vortex, towards the Suder iſland, there are other protuberances in the bottom, againſt which the current

is in like manner impelled, and the agitation attended with a very dreadful noise. A clear idea of what is described in the foregoing account cannot be perfectly conveyed by a description. The judicious reader will readily conceive, what a perilous place such a vortex must be in a hard gale of wind, and a full tide, since even in a calm, when the current is most gentle, and at the turn of the tide, which is the only time fishermen can venture out, the boats are whirled round on the surface of it.

The whirlpool, below the isle of Sand, continues circulating to its innermost centre, and is of no great depth in the middle. The third whirlpool, betwixt the northward islands, I have visited twice myself, and upon approaching it, the boat was attracted towards it, with such force, that it was with great difficulty the people prevented the stream from getting the better of us, labouring at the oars on one side, and steering with them on the other. If a boat be caught by the stream, the current first whirls it twice round, and then twice round in a contrary direction, this alternative continuing four or five times, from which the nature of the bottom becomes easily determinable.

These abysses have engaged the attention of many ingenious heads, the depth of the waters being such, that no one could, for a long time, venture to sound the bottom, so that the general opinion among the learned was, that they were gulphs, or abysses, such as caused the ebb and flood. Among others, Kircher writes of the famous vortex in Norway, called Moskoestrom, that it is a sea-vortex, attracting the flood under the shore of Norway, where, thro' another abyss, it is discharged into the gulph of Bothnia, which opinion is embraced by M. Herbin, in a dissertation delivered by him at Copenhagen, 1670. But as this opinion is only founded in weak reports, it is totally erroneous, as will appear from the following arguments. First, this Moskoestrom runs along the country, betwixt two shores, or islands, where the bottom, or ground of the sea, is full of eminences, and without any pits. Of the like nature also are all the vortices, both in Feroe and in Bothnia. Kircher likewise affirms, that many such abysses are to be found throughout the whole world, but always near the continent, or betwixt small islands. Such is the situation of Scylla and Charybdis, in the sea of Sicily, the one be-

Lib. ii. Hydrog.

In Tabula Geograph. Hydrog.

low Sicily, and the other at the point of Calabria; and for the greater confirmation of this matter, Kircher mentions a high rock ſtanding out in the middle of this current, like the rock before deſcribed, in the vortex called Sumboe, and certainly theſe high rocks, in the midſt of ſuch perilous ſtreams, are no other than natural marks ſet up by God himſelf, that navigators, having timely notice, may avoid the danger

Next, Mr Peter Clauſſon, in his deſcription of Norway, writes, that the gyration of the water is attended with ſuch roaring agitations as to be heard many miles off This would not be the caſe were this vortex occaſioned by the extraordinary profundity of the bottom, for it is deepeſt in ſtill waters, but theſe roarings proceed from the water being retarded, by its contraction betwixt two iſlands, in its progreſs towards the land at the time of flood, and likewiſe in its regreſs thro' the ſame narrow paſſage at ebb; and, moreover, the flood is obſtructed by ſpiral hills, or protuberances, and lofty angular rocks, from whence it is natural to conclude, that ſuch violent colliſions muſt cauſe a terrible noiſe Thirdly, Mr Clauſſon writes, that this ſtream abſorbs whole trees, and after ſubmerging them, they come up again with their roots and branches ſtript and torn, which is occaſioned by theſe round and angular rocks, which in the rapid gyrations of the trees round them, ſtrip the bark, and tear the roots and branches; and many of theſe mangled trees are driven to Ferroe, whereas in an abyſs, they would be carried another way, for then the cavity would be large and deep, and the water circulate gently, and whatever was abſorbed would paſs through the abyſs without any damage, as may be ſeen from the plain inſtance of a piece of wood put into a funnel, afterwards filled with water." Thus far Mr Debes

It is evident, from the premiſes, that ſome ancient and foreign writers, who could not minutely examine the circumſtances, miſtook theſe vortices as the cauſe of the ebb and flood, of which they are, on the contrary, in reality the effect I muſt not omit here, that Mr Jonas Rimus, in the above-mentioned place, page 220, &c labours to ſhew it probable, that Scylla and Charybdis, which have always been accounted to lie upon the coaſt of Sicily, were no other than this Moſkoeſtrom, whither Ulyſſes was

actually

actually driven in the courſe of his wanderings, the inundations of the water (in the Daniſh language, Vanders Skyllen) and the iſland Skarſholm, having given occaſion to the names of Scylla and Charybdis Though I can by no means agree to the opinion of this ingenious Gentleman, concerning Ulyſſes's voyage, yet, in proving the probability of it in another learned piece, it muſt be confeſſed, that he has given proofs of an uncommon erudition and genius, and as to the Moſkoeſtrom, I ſhall exhibit his opinion in his own words, that then the reader may adopt as much and as little of it as he pleaſes

Singular opinion concerning the ſituation of Scylla and Charybdis

" Halogaland appears to be one of the firſt inhabited provinces in Norway, for ſoon after the Trojan war, Ulyſſes, whoſe name was Outin, ſailing to the extreme limits of the great ocean, arrived in a dark country, of which he gives the following deſcription, it was full of high mountains, reaching to the very clouds, and perpetually covered with miſts and thick darkneſs, ſo that they never enjoyed the benefit of the ſun, neither at its riſing nor ſetting, and there he met with two horrible ſea-vortices, Scylla and Charybdis, the noiſe of which ſtruck him with terror, before he came near them, and then he ſaw a violent ebullition of the ſea, like a boiling-kettle, throwing up froth and ſmoke, which were rapidly carried up in the air All this has by many been falſly interpreted of the ſtrait near Sicily, though that iſland has none of thoſe high mountains, covered with dark clouds, nor that gloominеſs impenatrable to the rays of the ſun, nor a perillous roaring ſtream, ſo as to be impaſſable without extreme danger But all this perfectly coincides with Moſkoeſtrom, near Helleland, where there are, on the ſide of Lofode, thoſe high mountains called Helſeggen, the ſummits of which, according to Homer's deſcription, were inacceſſible to any man, tho' he had twenty hands and feet, and in winter involved in continual miſts and darkneſs, for from the 27th of November to the 25th of December, old ſtile, the ſun is never ſeen there There, likewiſe, are thoſe terrible ebullitions, and horrible ſounds, which ſo terrified Ulyſſes at Scylla and Charybdis, circumſtances quite ſimilar to the roaring fall betwixt Helſeggen and Moſkoe, where the ſtream overflows the intermediate rocks and iſlands, and thus came to be called Scilla, from Skillers, and on the other ſide of

Moſkoe, are alſo iſlands and rocks, againſt which the ſtream breaks, among theſe, particularly, is the iſland Skarholm, which may be taken for Charybdis

The ancient geographers are known to have had ſome information of ſea-vortices in the north, and according to their opinion, lying under the north-pole, as Jacobus Cnoxen of Buſcodun, in his Itinerarium, and Mercator in his Atlas, pretend, whoſe opinions alſo Bertius has followed, and given a repreſentation of ſome ſea-abyſſes under the north-pole, together with an iſland, which he calls Ruſt, but as we are now ſenſible that there is no going within ſeveral degrees of the north-pole, on account of the extreme cold, and of the ice-mountains, therefore this ſea-abyſs, of which they had heard, can be no other than this Moſkoeſtrom, which lies no further north than a little beyond the ſixty-eighth degree; and the navigators, who frequent the more northern ſeas, have hitherto met with no other vortices And as for the iſland Ruſt, near which this ſea-vortex is placed, the ſimilitude of the name ſhews it to be the iſland Roeſt, which is but four Norway miles from the Moſkoeſtrom This iſland of Ruſt, may poſſibly be the ſame neſs, or cape, in the north, to which Pliny gives the name of Rubeas

Ulyſſes afterwards reports, that ten days after ſailing by Charybdis, he came to the iſland Ogygia, which he deſcribes, as divided by four rivers, each having its particular outlet This remarkably correſponds with the iſland Hinde, which is ſo interſected by deep creeks, in the ſouth, north, and eaſt parts, as to be divided into four parts, of which the ſouthern belongs to Salten, both the weſtern parts to Lofoden and Weſteraalen, and the north part to Senmen One of theſe creeks is called Oegursfiord, or Agisfiord, in appellation which has ſome affinity with that of Ogygia, and that Ulyſſes, whoſe name was Outin, lived ſeven years in this iſland, married and had children there, agrees with the account of our chronicles concerning Outin, where his genealogy is called Halegatal, becauſe his deſcendants lived in Halogaland, from which Outin's Hagen Ladejul derives his origin, and according to Sturleſon, this genealogy has thence obtained the name of Halegatal

Plutarch,

Plutarch, likewiſe, in his treatiſe De Facie in orbe Lunæ, makes mention of ſome Grecian people, who lived in the iſlands of the north, where the ſun was viſible for thirty days together, and did not, during that time, deſcend above an hour beneath the horizon. This can be applicable to no other iſlands, than thoſe in Helleland and Salten, for to this preſent time, neither in the eaſt or weſt, has any iſland been diſcovered, with any ſuch phænomena, but on the iſland of Dum, in Helleland, the ſun, in ſummer, about the longeſt day, is clearly ſeen both day and night, which ſhews this iſland to lie in the 66 ½ degree under the arctic polar circle, where the frigid zone begins, but the farther one advances towards the north, the higher the ſun is ſeen at midnight, above the horizon. It is very poſſible that Pliny might have intelligence of this iſland of Dum, if that, which he calls Dumna, be the very ſame iſland. And when Plutarch further writes, that the Greeks on that iſland, were perſons of abſtemious lives, and accounted a moſt venerable race, this tallies with Sturleſen's relation of Outin, and his retinue, namely, that they were held to be gods, and that divine honours were paid to them." So far I have cited from Mr. Ramus.

Another remarkable particular in the waters of the north, and withal, to me more unaccountable, than what has hitherto been mentioned of the Moſkoeſtrom, is the Kulſtrom, as it is called, four Norway miles off Bergen, in the pariſh of Lindaas, running betwixt the continent and many ſmall iſlands, and to which we may properly apply the motto, *Semper contrarius eſto*, from the continual oppoſition of its courſe to that of others, flowing when they ebb, and ebbing at their floods. Whether this irregularity be owing to the length of its courſe, in ſeveral ſmall channels between the iſlands, the water being ſo long detained as not to ebb, till it returns from the ſea in other places, or what other cauſe further experience may ſuggeſt, I paſs over, concluding, with this admonition, that on this Kulſtrom, the inadvertency of a pilot is extremely dangerous, of which there was once a melancholy inſtance in the loſs of ſeven northland barks. The Kulſtrom.

SECT XI

Fresh waters, particularly springs in Norway

From the north-sea, and the salt-waters, I now proceed to the fresh springs, rivers, and lakes Here, as in other places, these are not equally light, pure, and wholsom, their qualities depending on their bottom, or the strata of earth or stone which they meet with in their course, generally bringing with them particles of what they have carried off by the way As to this circumstance, our Norway springs are not much to be boasted of; for their beds, or bottoms, shew them to have so much chalk, clay, or oaker in them, that a drop on a plate, leaves a white, brown, or yellow spot However, the fresh-water in Norway, in general, may be considered as good and salubrious, I may say, very good, in comparison with others, as the water, together with the air, unquestionably, contributes greatly to the vigour of the inhabitants, who enjoy an uninterrupted health, to a length of days, more general and far beyond the period allotted to the inhabitants of most other parts of Europe The common people especially, hold out to a very advanced age, for they live more upon water, than wine and other strong liquors The metal, of which there is most abundance, both here and in Sweden, and which consequently most of all tinges the fresh-waters, is iron, for the aqueous particles being analysed, there remains a ferruginous matter subsided, which the magnet attracts, and which has upon most people a laxative effect

There is likewise, no doubt, that our country affords several kinds of medicinal springs, tho, for want of due search, few such are become known, as the learned M Lochstor complains in the following words, which I the rather insert, as they at the same time mention one of the fore-mentioned medicinal springs "Coronidis loco monendum duxi, haud deesse Norvegiæ fontes medicatos, [illegible] qui in horum vires et principia inquirant, [illegible] rerum studiosos Memini etiam, me vidisse fontem quem paucis abhinc annis invenit sedulus naturæ scrutator [illegible] meus [illegible] Rebiham in diæceseos Christianensis districtu, cui nomen Hickedalen, circa villam quam habitant vulgo [illegible] mineralis quidam aquæ scaturiginem, a cujus usu convaluere varii morbis laborantes, ita ut etiam fama

I

ad

ad exteros venerit, qui magnam hujus aquæ copiam ſibi apportari curarunt.' About two years ago, when I made a viſit to Counſellor Swerdrup, proprietor of the iron manufacture at Hakkedal, he carried me to a ſpring, which is probably that mentioned by M Lochſtar, upon taſting it, I found the water light and palatable, and, as the proprietor informed me, it is very ſalubrious, eſpecially in hypocondriac caſes, by attenuating and rectifying the inſpiſſated blood

Mr Peter Nicholas Undalin, in his deſcription of Norway, relates from an old book, called Speculum Morale (doubtleſs a manuſcript now loſt) that the water of Birkedahl fen in Sundmoer, in this dioceſe, has a petrifying quality, and that within three years it turns hazle into ſtone, but not elder, which grows near it As ſuch a power is inherent in ſome waters*, and I myſelf have ſeveral undeniable petrefactions of beech, hazle, willow, and other wood, I made no difficulty of giving credit to this account, and tho' it appeared a little ſuſpicious, when I firſt received ſome of this pretended petrefaction from the fen of Sundmoer, yet I ſuſpended my judgment, till laſt ſummer, when on my viſitation, I had an opportunity of informing myſelf more particularly from the miniſter of the place, Mr Jver Munthe, at Volden I found that there was no ſuch thing as petrifying water in Birkedal-fen, but that on one ſide of it, there is a piece of an Amianthus, or Aſbeſtos rock, which being diviſible into long pliant threads, like flax, and being more like wood than ſtone, has been given out for petrified wood, and brought the neighbouring moraſs into great and undeſerved honour and reputation This is ſo far from being any thing new, that it is a very ancient tradition, and many intelligent perſons have been deceived by it, among others, Giral Cambrenſis, as appears from his Topography Hibern cap viii where he ſays, "Eſt et in Norvegia fons ſimilis naturæ, ſed tanto tamen efficaciæ majoris, quanto ad frigidam zonam magis accedit In hoc enim non tantum ligna, ſed et lina lineaque telæ per annum impoſitæ duriſſimum in lapidem congelantur,

* The water does actually pervade, either longitudinally or tranſverſely, the minute interſtices of the wood, fills it with ſuch particles, diſſolved in it, and when by a cauſtic corroſive power, which it derives from lime, which deſtroyed the wood, it then appears in the form of the vegetable into which it penetrated Hunb Mag Vol II p 162

unde

unde et Waldemaro Danorum regi noſtris diebus regnanti, quidam epiſcopus Norvegiæ Aſloenſis, quod anno præterito probandi cauſa ab eodem ſuſceperat, naturæ jam retulit bipartitæ parte enim media fonti impoſita lapis erat, altera parte, qua extra jacuerat, in ſua permanente natura"

SECT XII

Brooks Rivers rivulets, freſh lakes, and iſlands floating in them

From the many ſprings iſſuing out of the mountains in Norway, and from the vaſt maſſes of ſnow accumulated on the ſummits of them, whence, at times gently diſſolving, they ſend down great quantities of water, I have already taken occaſion to obſerve the providence of the wiſe and good Creator, in theſe innumerable ſupplies of water, which ſtreaming down the mountains, water their parched ſides, and in their further progreſs, refreſh the vallies and the level country beneath By the junction and confluence of ſeveral of theſe rivulets, are formed thoſe large ſtreams and rivers, which in the old northern language, were called by the general name of Elven, from whence one of the largeſt rivers in Germany, by way of eminence, derives it name of Elbe (Elven) I ſhall here ſpeak of ſome of the moſt noted of theſe Elven, according to the beſt informations I could procure.

The Nied, is a river iſſuing from Tydalen, on the Borders of Sweden, runs weſtward into the lake Selboe, afterwards, winds to the northward, paſſing by the city of Drontheim, to which it anciently gave the Latin, as well as a Norwegian, name of Nideros, or Nidroſia

Sule-Elv, ſo called from the mountain Sule (Sulefield) from whence, deſcending in rapid courſe, it runs through Nordale into the ſea

Gulen, or Gulen, has its riſe eaſtward, near Skarsfield, a mountain in the north, on this ſide Roraas, and after running about twenty leagues weſtward, through Valen, Hlotvaden, Storen, and Mellums, diſcharges itſelf into the ſea, about a league to the weſt of Drontheim In the year 1345, great damages were done by a ſurprizing inundation of this river, which, to the aſtoniſhment of the country, ſeemed totally drained, but in the mean time had burned itſelf under-ground, from whence it again burſt forth with ſuch violence, that the earth and ſtones thrown up by the

the eruption, filled the valley, and made a kind of dam, which, however, was broke through, and washed away by the force of the water On this occasion, besides some churches, forty-eight farm-houses were destroyed, and two hundred and fifty persons drowned.

Otteroen is the largest river on the side of Agde, running thirty leagues from the mountain, through Sætterdale and Efie, to the cataract of Wiland, into which it empties itself

Syre, or the river Sire, rises near the mountain Lang, runs thro' the vale of Syre into the lake of Lunde, in the diocese of Christiansand, afterwards it discharges itself into the sea, not through a broad mouth, or by a gentle fall, as usual to other rivers, but shoots into it like an arrow, through a very contracted strait betwixt rocks, with such an impetuosity as creates, even in the calmest weather, a great agitation in the water, for the length of two leagues, and from my own experience, I can say, that the seamen must be very careful of coming too near it *

Nid, which gives name to the lordship of Nedenes, and Skeen, from whence a town is so called, both issue out of Tellemark; and are equally large Great quantities of timber for saw-mills being floated on them, the falls have, with infinite labour, been diverted, by canals and passages cut through the rocks.

The river Tyrefiord, or Dramme, discharges itself into the sea near Bragnes, whither it also brings timber; near Honefosse, it is joined by two large rivers, of which one comes from Oedale, and the other from Hadeland.

Loven, or Laven, rises in the highest part of Nummedal, and after watering Kongsberg, loses itself in the sea near Laurwig, which derives its name from it

Glaamen, or Glommen, is the largest river in all Norway, and as such distinguished by the name of Stor-Elven, the great river; from the foot of the mountain of Dofre it runs a long way thro' Oesterdale and Soloe, afterwards joins the Vorme, another large river, which comes out of Mioes and Guldbrandsdale, then traversing the lake Oeyeren, it hastens to Sarp, near Friederichstadt, whose chief dependance is the timber trade.

* It is unquestionably from some such confinement of a narrow outlet, that the Rhone protrudes its waters into the lake of Geneva, with such rapidity, that to a considerable distance, they retain their natural freshness, without any mixture of those of the lake

Among the freſh-water lakes*, through which theſe rivers run, the moſt noted are Ryſſvand in Nordland, Snaaſen, the lake Selboe, the greater and leſſer Mioes, Slirevand, Sperdille, Rand, Veſten, Saren, Modum, Lund, Norſoe, Hvidſoe, Fariſvand, Oeyevand, and ſeveral others, the ſituations of which may be found in the maps My preſent deſign requires me only to obſerve, that theſe lakes abound in fiſh, and are navigable, in caſe of neceſſity, for large veſſels The hiſtory of Norway even informs us of fleets fitted out, and wars carried on in theſe inland ſeas, betwixt the kings and their competitors † In ſome of them are alſo floating iſlands, or parcels of land about thirty or forty ells in length, with trees growing on them, which having been ſeparated from the main land, are driven about as the wind ſets, and when cloſe to the ſhore, are ſhoved off with a pole They are ſaid to grow, as it were, by the acceſſion of reeds, graſs, weeds, and the like ſubſtances Both the Plinys, eſpecially the younger, mention the like curioſities in Italy, which Kircher has alſo thought worth notice, in his Mundus Subterraneus, lib v cap 2 particularly the floating iſlands on the lake di Bagni, or Solfatará, four miles from Tivoli, and, in my opinion, they are not different from thoſe which I have ſeveral times ſeen in this country, particularly in 1749, on my return from Chriſtiania, when the rains had ſwelled the river near Nitſund to ſuch a degree, that it overflowed a conſiderable tract on both ſides of the valley, riſing above the tops of the middling trees, and carrying away great quantities of earth and wood, ſome of which floated along ſide of my boat Yet this is not a matter of ſo much wonder as what is called the Mardyne, which is frequently met with on the ſalt-water, in the creeks, theſe are level clods compoſed of ſea-graſs, twigs, and the foam of the ſea, upon which, the fiſhermen ſay, certain ſea-fowls lay their eggs If this be matter of fact, it muſt be acknowledged another inſtance of the providence and wiſe diſpoſition of the Creator

Floating iſlands

Iſlands of pumice

* M Scheuchzer, in his treatiſe on the Menſuration of the Height of Mountains, judiciouſly ſhews the wiſe diſpoſition of Providence, in providing for rivers, eſpecially in mountainous countries, room to ſubſide and break the violence of their fall or courſe, in the lakes where they ſpread their waters Without this proviſion, they might by their inundations in ſummer, when the ſnows melt on the mountains, occaſion great damage to the grain and corn in the vallies beneath Philoſoph Tranſact Vol xxxv N° 1

† Several veſſels of conſiderable burden are ſtill uſed in Faris-Vand, and ſome others, for the carriage of goods, eſpecially for the uſe of the foundaries

SECT


Plan of the Situation
of Bingen Rossen
and the adjacent Country
200 feet
D
A
B
A. Head Lenzen
B. Help Lenzen
C. Wistye Lenzen
D. Fall of the Stream

5


B
C

SECT XIII.

Great advantages of theſe waters for embarking and forwarding the timber

At any great diſtance from the ſea, the rivers of Norway are not navigable for veſſels of conſiderable burden, for though in many places, there be a ſufficient depth of water, yet the waterfalls, cauſed by the intervening rocks and clifts, are unſurmountable obſtacles, the ſtream precipitating itſelf from a height of 6, 8, or 10 fathoms, where only maſts and ſuch timber can be floated down, and many of theſe are deſtroyed, yet the greateſt part get ſafely through, and being marked by their owners, are ſecured at the Lentzes These are large booms, fortified with iron bolts, and laid acroſs ſeveral parts of the river for ſtopping the timber The breaking of a Lentz is of ſuch ill conſequence to the timber-merchants, that in 1675 ſuch an accident which happen'd by an inundation of the Glommen, occaſioned many bankruptcies among them * As theſe and other rivers perform the capital ſervice of conveying from the mountains and foreſts thoſe maſts and timbers, which without ſuch conveyance would be abſolutely uſeleſs with reſpect to commerce, ſo by their ſeveral waterfalls they are of a further utility, in driving ſeveral hundred ſaw-mills, where, with little labour, planks and boards are ſawed to all dimenſions

See plate VII

SECT XIV.

Water falls from the rocks into the rivers

The vaſt force of rivers in ſome mountainous countries, where the fall from lofty rocks redoubles the motion of the water, may in ſome meaſure be conceived from what I have already related of the ſudden ſubterraneous courſe of the river Gule, and the inundation occaſioned by the ſubſequent eruption. But I ſhall here add another inſtance of this kind ſtill more wonderful, which, according to the authentic account from whence it is taken, happened in the year 1702 I mean the ſudden immerſion of the family ſeat of Borge near Friderickſtad into a deep abyſs The particulars of this unhappy and ſingular accident may be read in the 'nova literaria maris baltici ad ann 1703. maj p. 3 where is annexed a draught of the ſituation of the place. In the night of the

* The yearly charge of ſuch a Lentze or Boom, may in ſome places amount to three or four Hundred Rix Dollars, but in return it yields to the owner no leſs than a thouſand or eleven hundred, for at leaſt thirty thouſand dozen of large pieces of timber paſs through it, of which each makes ſix or eight planks

fifth of February, of the ſaid year, that ſuperb edifice, which was ſituate over againſt Hafflund, together with every thing in it, ſunk down into an abyſs of an hundred fathom deep, the gap being inſtantaneouſly filled up by a piece of water, betwixt three or four hundred ells long, and of half the breadth The houſe was doubly walled, but of theſe, as well as ſeveral high towers, not the leaſt trace was to be ſeen, with it periſhed fourteen ſouls, and two hundred head of cattle. The lord and lady Wœrnſekiold, two children, and the ſteward had the good fortune providentially to ſave themſelves The lady being then near her time, was attended by a midwife, who in a great conſternation came to acquaint them, that the houſe and ground began to give way, upon which they immediately croſſed the water to a ſeat of her lord's brother, where the very next day the lady was delivered The cauſe of this ſo extraordinary cataſtrophe, was no other, than the aforementioned large river Glaamen or Glomen, which precipitating itſelf down the water-fall near Sarp, had probably for a long time, in its ſubterraneous concealment, undermined the foundation, * for its courſe there is extremely rapid, and the water-fall near Sarp, driving no leſs than ſeventeen mills, is ſo violent, that beſides the roarings thereof, which are heard four or five leagues off, its water is thrown up into the air to ſuch a height, that at ſome diſtance, in dry weather, it looks like rain, conſequently a rainbow may always be ſeen here when the ſun ſhines, its rays being frequently refracted among the drops of water, and thus is exhibited the cleareſt idea of the formation of that meteor Theſe water-falls in Norway which are of different height and rapidity, tho' none equal to this, are no leſs dangerous, on too near an approach to them than the above-mentioned Moſkoeſtrom Captain Wœrneſkiold had fatal experience of this in the year 1735, when, by inadvertency, the current of the Sarp water-fall overpowered him, and overſet the boat In theſe places ſwimming will not ſave the life of any animal, the ducks only excepted, who, after continuing for ſome time out of ſight, emerge alive without any hurt, according to the report of thoſe who have diverted themſelves with the experiment In ancient times this cataract is ſaid to have been made uſe of for

* An inſtance of the like happened in Switzerland, 1618, when the whole town of Plurs ſuddenly ſunk in and was never ſeen afterwards

the

the execution of traitors, rebels, chiefs of ſeditions, and the like peſts of ſociety, they were thrown down alive to be daſhed by the boiſterous waters againſt the points of the rocks, that they might periſh in a tumult, by a violence analogous to that, to which they had inſtigated others, a puniſhment, which, however ſevere, muſt be owned to have been very adequate and emblematical The Egyptian water-falls or cataracts, mentioned by Pliny, were probably not ſo remarkable as theſe, and ſome others, in Norway, the fall of them from the rocks not exceeding ſeven or eight feet And as the noiſe of our cataracts, how great ſoever, has never yet deprived any one of the ſenſe of hearing, Cicero's account of the Egyptian Catadupa, may be conſidered as viſionary *, though the learned Dr Richard Pocock, who in his deſcription of the Faſt, animadverts on this account, may not have recollected other and larger cataracts, which may be further up the country

SECT XV

Many of the bridges over the rivers are of a ſurpriſing conſtruction.

The bridges over the rivers in Norway, to the beſt of my knowledge, are not any where walled, but framed merely of timber, of which are made the ſtone-caſes, theſe are large and quadrangular, and ſerve as pillars or ſupporters, being filled with ſtones in order to ſettle them The largeſt of this kind, hereabouts, is the bridge of Sunde in Guldbrandſdale, where the water of the Great Miocs, which at firſt is called Oten and Laagen, begins to increaſe This bridge, of which it is ſaid that it is never finiſhed, ſome repairs being continually neceſſary, is a thouſand paces long, and conſiſts of forty-three Stone Caſes Here in the dioceſe of Bergen, where carriages can be very little uſed, it is not thought worth the while to build ſtrong and laſting bridges In many places, the manner of their conſtruction is thus, where the narrowneſs and rapidity of the current will not admit of ſinking any ſtone caſes, thick maſts are laid on each ſide of the ſhore, with the thickeſt end faſtened to the rocks of the mountains, one maſt being thus laid in the water, another is placed upon it, reaching a fathom beyond it, and then a third or fourth in the like progreſſion to the

* Ubi Nilus ad illa, qua catadupa nominantur, præcipitat ex altiſſimis montibus, ea gens, quæ illum locum accolit, propter magnitudinem ſoni, ſenſu audiendi caret Somn Scipion 5

middle of the ſtream, where it is joined with another connection of maſts from the oppoſite ſide, and this without any other cement than their contact, ſo that in the paſſage over it, eſpecially in the middle, the bridge appears to ſwing, which, to thoſe who are not uſed to it, appears ſo dangerous, that they alight from their horſes till they imagine themſelves out of danger

SECT XVI

Its way of travelling in the winter on the freſh water

The beſt paſſage in winter is by the rivers, eſpecially up the country As they are every where deeply frozen, the peaſants find a very great conveniency in them for conveying their goods to the towns in their ſledges, carriage being ſcarce practicable over the heights of the mountains The travellers are conveyed in theſe ſledges with great eaſe and expedition, for though the Norway leagues are very long, yet they go ſecurely at the rate of one league in an hour Theſe winter roads, likewiſe yield an agreeable proſpect, in the contraſt of the green valleys of pine and fir trees, with the ſnow, though the glaring of the latter, eſpecially in ſunſhine, ſoon offends the eye, and here a piece of crape over the face is of double ſervice, as it likewiſe preſerves the ſkin from the piercing froſt

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CHAP IV.

Of the Fertility of Norway in variety of Vegetables

SECT I

Great difference in the nature and quality of the ſoil

HAVING hitherto diſcourſed in general of the air, ſoil, and water of Norway, and having under farther conſideration, the animate and inanimate ſubſtances exiſting in thoſe elements, it appears moſt regular to proceed to the natural fertility of the earth

earth, in corn, graſs, roots, trees, and every other kind of vegetables. I ſhall give accounts of all theſe from my own knowledge, or the credible informations of others, not doubting withal, but my ſucceſſors in this work, will finiſh it with much leſs trouble, and much greater perfection, tho' to give univerſal ſatisfaction, is beyond the moſt extenſive knowledge, and the moſt correct judgment

Having ſpecified the diverſities of the ſoil and air in Norway, which poſſibly are greater than in any other country, it will appear, that vegetable products, as dependant thereon, vary in like manner Norway is almoſt every where ſo unfit for agriculture, tho' not for paſture, that upon a meaſurement of the plowed lands, I do not think, the proportion, in reſpect to the meadows and woods, the waſtes and barren mountains, would be greater, than as one to eighty, and if the peaſants of Norway were not conſiderably aſſiſted by the great fiſheries on the ſea-coaſts, and the timber and charcoal-trade for the mines, the graziery, and the liberty they have of killing game, the country could not be ſuppoſed to furniſh ſubſiſtance for above half the inhabitants, for as theſe viſibly increaſe, and ſpread themſelves year after year, ſo ſeveral tracts of uncultivated land, have been broke up and tilled; and ſeveral woods likewiſe have been burnt, and the land turned to huſbandry, yet, with all theſe expedients, there would ſtill be a ſcarcity in thoſe places, where the nature of the earth and the rocks are not capable of any cultivation Another misfortune is, that in ſome parts of the moſt fruitful provinces, as Gulbrandſdal, Oſterdal, Soloer, and elſewhere, the grain is ſubject to miſcarry by ſudden froſts, ſo that one day it may ſeem in a flouriſhing ſtate, and afford the pleaſing promiſe of a plentiful harveſt, but by the nipping cold of one night, it appears withered the next day, and drooping, ſo as never to attain to its proper ripeneſs It is to be obſerved, moreover, that in every century, as far as can be aſcertained from tradition, the country is viſited with ſome unfruitful years, which are remarkably ſo, and happen two, three, or four, ſucceſſively, ſuch were the years from 1740 to 1744, when the ſun ſeemed to have loſt all its heat and genial power, the vegetables grew, but ſhort of their natural height, and budded, and bloomed, without bearing In thoſe years, the trees, likewiſe,

Pernicious nigh froſts

failed in their growth and uſual verdure, having no ſhoots at all, at the tips of the twigs Moſt of the grain, that was ſown, alſo periſhed, yielding only empty ears, inſomuch that the diſappointed peaſant was reduced to extreme diſtreſs, from the uncertainty of any advantages in the labours and charges of the enſuing year Something like this, tho' in a leſs degree, was felt in other places, during the above-mentioned calamitous years *

All theſe diſadvantages do but furniſh more matter for adoring, with the greater admiration, the impartial benignity of the Almighty Creator, in his proviſion for the ſuſtenance of the people of Norway, not only in the variety of other means of ſupport, which ſhall be ſpecified in their proper place, but by their harveſts, and ſucceſs in agriculture, which, however inconſiderable, in reſpect to thoſe of other countries, are much larger than a foreigner would conceive, till informed by an actual ſight of them Who would imagine, that Norway, in moſt years, ſhould have ſome thouſands of tuns of its own grain and produce, to ſpare for the adjacent provinces of Sweden? And who would imagine the fact, which Arn Bernſen reports in his book on the fruitfulneſs of Denmark and Norway, that ſome farms, even in the diſtrict of Nordland, beyond Drontheim, expend forty, nay, ſome an hundred tuns of barley in ſeed, and that of a good kind, tho' not equal to the rye of this part of the country, which is accounted preferable to that of Poland? This fertility of Norway, even in its moſt northern Provinces, as far as Finmark, to the 68th degree, cannot but excite the admiration of thinking perſons, ſince a line being drawn from the midſt of this fruitful province of Nordland, that is, from the diſtrict of Salten, eaſtward, over the mountain Kolen, into Swediſh Lapland, namely, Pitha-Lapmark, or even more to the ſouth, the country is one wild barren waſte, tho, according to Mr Hogſtrom's moſt ingenious and authentic deſcription of Swediſh Lapland, lately publiſhed, colonies, or new inhabitants, have, at the public charge, and by order of the government, been ſent to cultivate theſe barren parts

Abundant corn harveſts in ſome places

* If we recollect the weather from the year 1740 to the preſent year 1747, it muſt be allowed very extraordinary The winters were long and ſevere, the ſummers but moderate, with little rain in many places, an almoſt continual ſtrong wind at north eaſt It were to be wiſhed that the naturaliſts would favour the public with their thoughts on ſo intereſting a ſubject Hamb Mag B I

For

For the cauſe of ſuch a great difference, in point of fertility, at an equal diſtance from the line, the reader muſt be referred to what I have ſaid in the firſt Chapter, Sect VI concerning the difference of the cold and warmth, the ſharp and mild air in the dioceſes of Aggerhuus and Bergen, which, tho' manifeſtly in a parallel latitude, differ as much in reſpect of cold and heat, as if they were ſituate ten degrees from each other This, as I have before obſerved, is to be attributed to the warm vapours of the ſea, which, ſpreading themſelves over the weſtern ſide, moderate the winters there, and have the ſame effect in all the maritime diſtricts, to a hundred Norway miles north of Bergen, ſo that in fruitfulneſs, Nordland ſurpaſſes even this dioceſe, though with the additional advantage of better vallies, and larger tracts for tillage*, whereas, Swediſh Lapland, which lies in a direct line behind Nordland, is deprived of theſe warm vapours by the Koelen range of mountains, which intercepts them, as Fileſield does in the dioceſe of Bergen.

Next to that of Nordland, the moſt fruitful provinces in the dioceſe of Drontheim, are Inderherre and Nummedal, in that of Bergen, Sognefiord and Vaas; in that of Chriſtianſand, Jedderen, Ryeſylk, Raabygdelag, and the lordſhip of Nedenes, in the dioceſe of Aggerhuus, Hedemark, all which are not in the leaſt inferior to the beſt corn countries in Denmark; and beſides theſe, are Hadeland, Toten, Romerige, Ringerige, and Gulbrandſdale All theſe territories uſually yield grain enough, not only for the ſupport of their inhabitants, but a large ſurplus, which they diſpoſe of among their neighbours, and even among the Swedes On the other hand, in many places, a third or fourth of the inhabitants are not in a capacity of laying up a neceſſary quantity, which deficiency, however, is otherwiſe compenſated to them

SECT II

It is moreover, remarkable, that the corn-grounds throughout the dioceſe of Bergen, which, on account of the many mountains, Norway more fruitful than for ſeveral miles

* Agreeable to this, is what Thomas Bartholin ſays of the cauſe of the mild winters in Feroe, which lies in the middle of the north-ſea "Aqua influit Feroæ ſe allabens, quanquam per ſe frigida ſit, ſalſedine tamen ſua ex perpetuo motu plerumque producit hyemem temperatam" Acta Med Hafn ad ann 1673 Vol III P 371

are few, as to the best of my knowledge they, in most places, never lie fallow, but are every year plowed and sowed, bear all kinds of grain, barley and oats especially, and not only six, eight, or ten fold, but in some places with a much greater increase *; and the corn is generally allowed to be longer, and the ears fuller, than what is imported from Denmark and Germany, being inferior only to the English corn, which the Norwegians prefer to any other. I shall soon come to treat of every sort of grain, under its particular head.

Cause of this fertility.

As to the cause of this fertility, which may appear very strange to foreigners, tho' it be strictly true, I shall give them the following indisputable account of it. The Almighty Creator, so wise and bountiful in his œconomy towards mankind, and whose greatness appears most conspicuously in the slender means he seems to make use of, appears to confer a double blessing on those small parcels of good land called closes and fields, which in other parts are looked upon only as little inclosures, and separated spots; yet he does not effect this in any supernatural or immediate manner. We know, that moisture and heat, are the two great promoters of fertility, and the fields of Norway enjoy a sufficiency of both †. They are not liable to such frequent and long droughts as other countries, being supplied either by rains or springs, gently issuing from the mountains, or the meltings of the masses of snow on the tops of the mountains. Besides, the snow-water, as well as the snow itself, is of a rich nature, so as by some to be thought a kind of manure. And when the fields begin to be parched, which is chiefly in the vallies, by the reflection of the sun, they are more easily refreshed by watering than in other countries, as being few, and of no great extent. In some parts, particularly Guldbrandsdale,

* Mr. Lucas Debes, in his account of Feroe, p. 196, says, that a tun of corn-land often yields twenty or thirty tuns of corn, yet is this in the main but a small matter, much less ... of corn-ground, and where few can sow above a tun or two.

† "Tanta est soli ea usque fecunditas inter rupes boreales, ut semina terræ commissa multiplicato fœnore agricolis reddant. In vallibus Feroensibus, ex unico hordei grano, quinquaginta culmi cum totidem spicis excreverunt granis turgidis, parci item terræ N. B. ubi non provenit clarior natura. Non fabulor; vidi ego; ipse culmos vidi et manibus hisce palpavi." And in another passage soon after: "Ratio fertilitatis borealis ex nivibus repetenda tum imprimis liquescentibus, et ex solis radiis, quas inter rupes fortius agunt. Et quamquam in rupibus superficies terræ profunda non sit, ea tamen recipiendis fovendisque radicibus frumenti sufficit, quoniam, ut Theophrastus docet, Lib. I. de Caus. Plant. c. xxii. plures quidem frumentum radices capessit, sed non alte descendunt." Th. Bartholin. Act. Med. Hafn. Vol. ...

dale,

dale the peaſants, which according to Tavernier, is alſo practiſed in Perſia, have contrived aqueducts from the upper grounds to the lower. Theſe aqueducts are formed of hollowed timbers, which are not very expenſive, and are carried on from the neareſt ſpring to the field, out of theſe the water is thrown in ſhovels over the field, after the manner uſed at ſea for wetting the ſails, that they may draw the better and hold more wind.

Heat betwixt the mountains

As to the other principal cauſe of this fertility, I have, in the firſt chapter on the climate, ſhewn, that by the compreſſion of the rays of the ſun, collected betwixt the mountains, as betwixt the lofty houſes in Copenhagen, the ſun is extremely hot, or rather ſo intenſe, that without the ſummer breezes daily blowing from the ſea along the creeks, whereby this heat is tempered, it would of all things be the moſt pernicious to the ploughed land. Hence our harveſt is as forward, as theirs in Denmark or Lower Saxony; though our ſeed-time be later, yet the nights being ſhort, the ground remains in a continual warmth, thus the growth of the corn advances without any check or intermiſſion, that within the ſpace of nine weeks the farmer has houſed his corn. For the better clearing and confirming this point, I ſhall ſet down the words of a conſummate Swediſh naturaliſt, the celebrated Linnæus, in his diſſertation on the natural planting of Vegetables. "To- wards the pole the ſummers are ſhorter, and the days longer. The ſummer in France being longer than in Lapland, the fruits ripen ſooner in Lapland than in France. About Paris the cool nights are longer, during which the growth being checked, they require the longer time for their full maturity, whereas in Lapland, the ſummer having little or no night, the fruits are in an uninterrupted progreſs. In 1732, for inſtance, corn was ſown on the 31ſt of May, and in the barn by the 28th of July, having attained its due ripeneſs in 58 days. In the ſame year rye was likewiſe ſown on the 31ſt of May, and cut the 5th of Auguſt, ripening in 66 days, this happened in Lulaa Lapland, whereas further ſouth there was no ſuch forwardneſs."

Tranſactions of the Swediſh Acad of ſciences, Vol 1 p 22

SECT. III.

Agriculture in Norway, is not ſo burdenſom to the farmer as in other parts, for here he does not toil in the fields of an oppreſ-

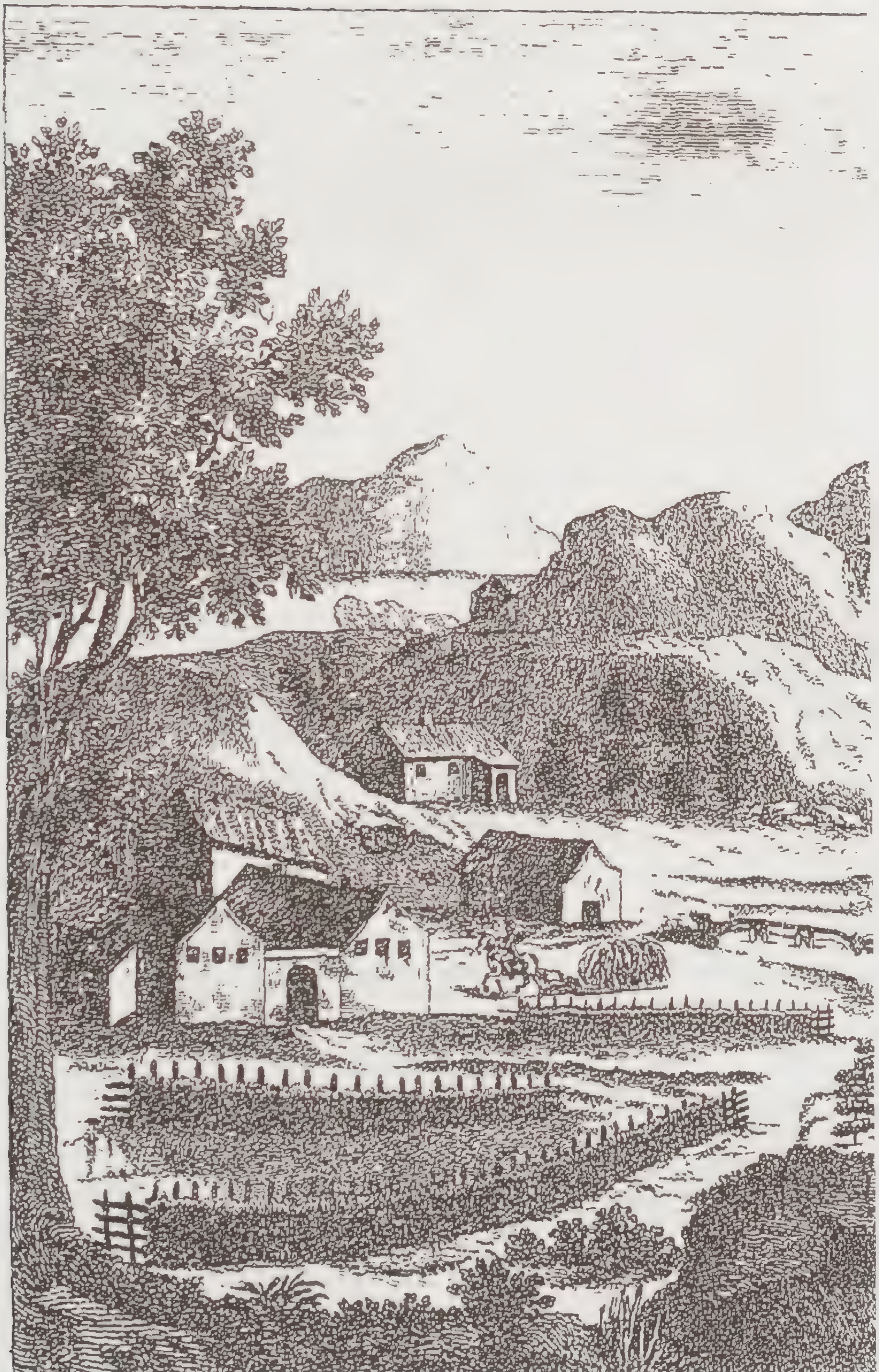
ſive

ſive lord, but the fruits of his labour are his abſolute and certain property But, on the other hand, it happens in many places to be attended with great labor and inconvenience, the fields conſiſting of little ſpots of ground among the rocks, many of which muſt be dug, inſtead of being plowed, and particularly here, in the dioceſe of Bergen, where the ſoil is leſs fruitful, and affords but few places, where the plow can be uſed, as it is in the eaſtern provinces * The harveſt alſo is not without its difficulties, the grain, according to the old cuſtom of the peaſants, not being mowed with a ſcythe, except about Chriſtiania, where it is lately come into uſe, but cut with a ſickle, and this is their practice even in thoſe few places where the ground is level and clear of ſtones, for the corn often grows ſo thick and cloſe, and the ſtalks are ſo apt to bend under the weight of the ears, that the reapers, both here and in the marſh-lands, graſp the ſtems with one hand, cutting them with
Plate VIII. the other, and immediately bind them in ſheaves, which never lie long on the ground, for, that they may be thoroughly aired and dried, a great number of poles five or ſix ells long are ſet up in the field, and ſix or eight ſheaves hung to each pole, ſo that ſeveral days rain, if it ſhould fall, would ſoon be exhaled and diſcharged, and then the corn is houſed In this part of the harveſt-work no waggons are uſed, except on the frontiers, where waggons have been introduced, but inſtead of them, the Norway peaſants uſe ſledges, for they are prejudiced againſt any other vehicles, even in places where waggons might eaſily travel, and though their work would be performed with greater eaſe and expedition But in this and every thing elſe, they are ſo ſuperſtitiouſly tenacious of the uſages tranſmitted to them by their forefathers, that they will not venture to remove a ſtone, which their fathers had ſuffered to lie This ruſtic bigotry, which, more or leſs, prevails every where, is a great obſtruction to public utility, counteracting all improvements in agriculture, the peaſants here being more inclined to fell timber to ſerve in the fiſheries, and the like, than to clear and improve their lands However, this error gradually loſes ground, ſince from the peaceable ſtate of

* In ſome places where the ground is very ſtony, a crooked ſtick with an iron at the end is made to ſerve inſtead of a plow, as this yields eaſier to the ſtones, is not ſo ſubject to break

affairs

par. 1



6 Hay and Corn

" Harvest "

affairs, an eſtate is come to be divided into ſeveral parts, three or four families now procure a comfortable ſupport from a farm, which before was a ſubſiſtence only for one * This has encouraged a diligent enquiry after ſpots of ground proper for ſowing; ſtones begin to be removed, fens and moraſſes are drained by trenches, which are here called Veiter †, for carrying off the water, and are uſed in the newly cultivated grounds in many places, tranſverſally, underneath them, an ell or two deep in the ground, where they are covered with earth, and lined with ſtones The peaſants are likewiſe improved in their knowlege of manures, and diligence in the uſe of them, ſuch as fern and other large weeds, heath or moſs, ſea-graſs, and other ſea vegetables, likewiſe a kind of reddiſh earth, all which hath in many places had the good effect of enriching the worſt and moſt unpromiſing lands With reſpect to this ſignal increaſe and advancement of agriculture in this century, Mr Peter Schrader, ſuperintendant and miniſter of Karmen, in the diocefe of Chriſtianſand in a letter to me, among other things, mentions the following particulars; " the advantages this country has received from the indefatigable application of the inhabitants, within theſe forty or fifty years, in the improvement and augmentation of their arable lands, is beyond credit Heretofore the farmer, who by his yearly tillage could ſupport his family till Chriſtmas, was accounted a notable man and in good circumſtances, whereas now, in thoſe years, when God does not puniſh the land with any remarkable ſcarcity, the inhabitants throughout this diſtrict, are, from their own grounds, not only plentifully provided with malt, barley and oats, throughout the whole year, but ſend ſome hundred tuns to market to Bergen, Hardanger, and Stavanger, &c " In another letter this gentleman, who is well experienced in huſbandry, communicates to me, at my requeſt, ſome obſervations on the proper application of the ſeveral kinds of manure to the quality of ſoils,

* Even in this Diocefe, where we have but little room for tillage, large farms are parcelled out to ſeveral farmers, and from the number of houſes make the appearance of no mean village, Oppedal, for inſtance, an eſtate in the pariſh of Kniſtelving in Hardanger, which in the land tax is aſſeſſed at 12 lobers of corn, that is 24 tuns, maintains 16 families, and theſe, according to the report of the miniſter, conſiſt of 130 ſouls

† An experienced countryman told me, that, by introducing theſe veiters in his lands, he had doubled their produce

which I likewiſe eſteem worthy of public notice "If the ſituation of a ſwampy field be ſuch, that the cold moiſture cannot be carried off by veiters, the natural reſource is the warm and dry dung of horſes and ſwine Where the ſoil is dry and deep enough, ſheeps-dung is the manure for barley, as cow or ox dung for oats, but if very hungry, ſandy or hilly, for ſuch there is no better manure than the earth of molehills in the ſwampy countries, which at harveſt is collected for this purpoſe By this diſtribut on of every kind of dung or manure, varied according to the ſoil, all the plowed lands may in time be improved doubly, and be brought nearly to an equal goodneſs

SECT IV

All kinds of grain are ſown in Norway, though not every where to equal advantage In Hedemark, Jeddern, and in Nordland, rye thrives beſt, but the very beſt is the burnt rye, which is ſown where woods have been burned for that end, and the aſhes left as manure They likewiſe ſow vœrling or ſpring-rye, and great quantities of both are uſed in Sondenfield, ſince the arrival there in 1624 of ſome Rye-finlanders, as they were called, for theſe inſtructed the peaſants in this method of converting their woods to arable uſes, and manuring the land with the aſhes However profitable this may be, where the woods will bear ſuch a conſumption, yet it is detrimental and prohibited in other parts The apparatus or method of proceeding is as follows A peaſant having found out a ſpot, which will anſwer to the ſowing of half, or a whole tun of ſeed, he fells the wood, and leaves it on the ground two years, till it be throughly dried When he propoſes to ſet fire to it, which is generally about midſummer, he waits till he obſerves cloud, which promiſe him rain, his ſucceſs in this caſe, depending thereon Yet it frequently happens, that many are the diſpoſes of the weather's neighbours conjectures, for one has no ſooner ſet fire to his wood, than another, relying on his judgment, does the like, and ſo on, that ſometimes the flames and ſmoak of theſe fires are ſeen at once throughout a whole country The wood being burned as much as poſſible, the greater pieces quenched, and the aſhes, together with the ſurface of the ſoil, the moſs, and ſmall roots being reduced to aſhes, without ſtaying till the earth

earth be cooled, the ſeeds are thrown on the aſhes, ſtill ſo hot that they give a ſmart crack, denoting that the huſks are ſplit. What remains is the expected rain to ſoak them, and if this actually happens, the peaſant may ſit down in the certain hope of ſuch an exuberant rye harveſt, as will ſcarce appear credible to foreigners, tho' upon enquiry it will be found in undoubted matter of fact, for, without any extraordinary accident, a ſingle buſhel of burnt rye, will produce ſix, ſometimes ten tun of the choiceſt rye * This is certainly the effect of the concentration of the vegetative ſpirit in the aſhes, which, before it can evaporate, impregnates the corn with ſuch wonderful fecundity And it is on this vegetative ſpirit that the chemiſts ground their regeneration of burnt plants, tho' in ſuch an open place, a great part of them muſt certainly be diſſipated by the intenſeneſs of the heat Theſe conflagrations ſometimes prove the occaſion of dreadful miſchiefs, as in the year 1739, at Oeyer in Guldbrandſdale, ſome houſes were burned, and ſeven perſons periſhed in them, proper notice not having been given to the neighbourhood The knops of the pines ſhoot along the air like rockets, and have been known to ſet fire to houſes at a conſiderable diſtance When the fire firſt ſeizes the green wood, it is not only very violent, but attended with a boiſterous wind and dreadful roarings

SECT V

Every part affords barley, but the beſt places for it are Nordland, the dioceſe of Aggerhuus, the lordſhip of Nedenes in the dioceſe of Chriſtianſand, and Sogneſiord in that of Bergen, where excellent malt is made of the common, and likewiſe of a particular kind, called David's-barley, or Heaven's-corn This barley, which in threſhing loſes its huſk, and very much reſembles wheat, the peaſants term Thor-barley, poſſibly from the opinion of the ancients, who, in their chimerical ideas of the Heaven, or Walhalla of the idol Thor, where the Cup of Health went briſkly round, imagined this corn to be fit for the banquets of the gods, and heroes Dr Lochſter, in his Diſſertation de Medicamentis Norvegiæ, &c extols the liquor made of it, both as palatable and Barley

* A buſhel, or in Daniſh a ſkepp, is the eighth part of a tun, thus the produce of one buſhel in ſeed is forty eight, ſixty four, or even eighty

whol-

wholsom. Palmam, says he, quoque reliquis præripit decoctum hordei cœlestis, vulgo Himmelbyg grato tam sapore quam effectu se commendans. Arn Bernsen, in his book above quoted, on the *Fruitfulness of Denmark and Norway*, pretends that sometimes in wet years, the Norway barley degenerates into oats; whilst others imagine, that good oats, especially in Hedemark, improve into barley. But, without further proof, such anomalous metamorphoses appear to me scarce credible *, and my opinion is, that what first gave rise to this notion, was an accidental and unobserved mixture of a little barley with oats, or of oats with barley, which in some years, happened to thrive better than the intended grain, and this unexpected increase was mistaken for a transmutation.

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Wonderful changes

SECT. VI.

Oats.

Oats, are the grain of the most general use in Norway, both for the peasant's bread, which is made of it, and in some places for a kind of malt. It is also much larger, whiter, and mellower, than in other countries, and thrives in those lands, where, by reason of moisture or poverty, no other grain will answer. That oats are no less nutritive than rye, may be judged not only from the horses, but the singular strength and vigour of the Norway peasants. But amidst the great benefits derived to our peasants from good oats, in some places, especially in Ryefylke, they complain loudly of a kind of wild or spurious oats, which the French call folle avoine. Where once this takes root, it is extremely difficult to be extirpated, over running large tracts of land, destroying the good grain, and proving as mischievous, as those complained of in Virgil,

Infelix lolium, et steriles dominantur avenæ.

* This however is disputed by Mr. Frederic Hofman in these words, "Who has ever yet perspicuously demonstrated, by what means some plants come to be transformed into other kinds, for instance, wheat into tares, good oats into wild, a nutmeg in Europe into a walnut, &c." See his Rational Physical Theolog. Sect. xxvii. p. 96. Whilst I am writing this, a worthy friend of mine assures me, that to satisfy himself in this doubt, he sowed a corn of the finest barley, without a single grain of oats among it; yet, at the harvest, of two ears of barley, one and a half proved oats. So I leave the matter without further discussion.

SECT. VII

White, grey, and green peas are ſowed, tho' not to any great quantity, both in Suden and Nordenfield, the ſoil being loomy; but the beſt are produced in the diſtrict of Sognefiord in this dioceſe, where they were introduced by a clergyman, about the middle of the laſt century, and his experiment having recommended itſelf to imitation, I ſhall here inſert a ſhort account of it Mr Jacob Kirſebom, miniſter of Sognedal *, reading in Sim Paul's Flora Danica, of an American ſmall pea, under the name of Piſum de gratia, one of which being ſet in M Klingenberg's garden, near Hamburg, had yielded 324, reſolved to ſend for ſome, and on trial found the fertility of his Norway-garden far ſuperior to that near Hamburg, it yielded him 610 peas for one † Since which time the peas of thoſe parts have been very much in vogue here. Peas

Vetches, of which ſuch quantities are ſown in Denmark, as provender for horſes, Mr Jonas Ramus claſſes among the vegetables of Norway; whence I conclude that it muſt be far up the country where they grow, having, to the beſt of my remembrance, never ſeen any in theſe parts In Valders they are ſaid to grow ſpontaneouſly, and ſow themſelves, but in no great plenty. Vetches

SECT VIII

Wheat, and Buckwheat alſo grow here, but not in many places, tho', it is not improbable, that upon trial, the growth of it might be conſiderably increaſed Mr Hans Caſten Atche, miniſter of Leyerdal, in this dioceſe, being a native of Lolland, Wheat

* There is likewiſe a pariſh in the dioceſe of Chriſtianſund, which bears the name of Sognedal, and which I am apt to think was M Kirſebom's reſidence, and conſequently where he firſt brought peas in vogue, as I do not meet with his name among the clergy of this dioceſe

† Piſum minus, quod de gratia vocant, ex America ad Europæos tranſlatum centuplum fructum ferre fama eſt Atteſtatur D Simon Paulli, vir magnæ famæ et experientiæ, Claſſ III Quadripartitæ Botan in viridario nobiliſſ Klingenbergii prope Hamburgum, ſuccreviſſe pium hoc de gratia trecentorum et vigenti quatuor piſorum fertile Quo exemplo invitatus Dom Jacobus Joach Kirſebom, paſtor in Sognedal Norvegiæ, ex Hollandia iſta piſa ſibi aſſerri curans, recepit in Norvegia ex ſingulo piſo terræ ibidem commiſſo, 610 piſa, quemadmodum ad venerandum ſum parentem ſcripſit, d 2 Junii 1672, cum D Joach Paulli laudabili propoſito patriæque inſerviendi voluntate Indos Damicos Orient Navi petiturus prope Hafniæ Norv vento contrario ſubſiſteret Thom Barthol Acta Med et Philoſ Hafn vol I p 66

which is celebrated for its wheat, procured ſome from thence to ſow in his grounds, where he tells me, it anſwered both in quality and quantity to the produce of Lolland As to Buckwheat, the ſowing of it here, appears too hazardous, both from the ſhortneſs of the ſummers and the night-froſts, particularly towards the caſt, which this wheat cannot ſtand, being of Oriental origin, in reſpect of the ſouthern countries, and as ſuch, is by the French called Blé Sarazin However, ſome very good of this kind has been produced in Hedemark, and even in this dioceſe.

SECT IX

Hops. Both the north and ſouth parts have hop-gardens, but the beſt are thoſe of Hedemark and Solloer I have alſo ſeen very good at Sundmoer Flax and hemp likewiſe grow here, but in a very ſmall proportion to the demand for them The weſt ſide, particularly, affords little or none, tho' here it would be well worth while to encourage the ſowing hemp, on account of the great quantities uſed in making fiſhing-nets.

Flax and hemp

SECT X

Cattle. From the corn-land, I proceed to the paſturages or meadows, with which Norway is ſo liberally bleſt, as not only to equal other countries, but to ſurpaſs many A proof of this is, that in moſt of the provinces no fleſh, butter, cheeſe, &c is imported, except ſome bacon from Denmark, the good lands being too valuable to turn ſwine into them, whereas, every year from ſeveral parts, and chiefly Bergen, there is a very conſiderable foreign exportation of thoſe commodities, eſpecially ſuet and butter The beſt and moſt nutritive paſturages are in Loſoden, Veſteral, Vas, Vilders, Hallingdal, Tellemark, and the lordſhip of Nedenes The Norway-cows are not indeed of the ſize of thoſe in Denmark, and a conſequence of this is, that they alſo yield leſs milk, but is to their fatneſs, thoſe of the marſh-lands excepted, Denmark does not afford better, and accordingly the farmers here keep a greater number of cows The beſt dainties among the Norway peaſants conſiſt in milk-meats, and variety of cheeſes, on which they

they ſpread butter as on bread, beſides which, they regale themſelves with Draule, Myſſebrum, Gummegrœd, and other white meſſes.

How well the Norway graſs agrees with the ſheep, appears from Mr Berndſen's book of the fruitfulneſs of Denmark and Norway, where he ſays, that it is no uncommon thing for twenty-four or thirty-two pounds of ſuet to be found in one ram, and it is a ſtriking inſtance of the ſucculency and increaſe God has been pleaſed to beſtow on the Norway graſs, that a very ſmall valley, or dale, ſuffices for the ſupport of ſeveral families, and their cattle; Davigen in Nordfiord, for inſtance, is not above half a Norway mile in circumference, yet as Mr George Krog the miniſter there affirmed to me, it feeds very near two hundred people, and twelve hundred cattle of different kinds

It is however to be obſerved, that in the ſpring the cattle do not graze in the vallies and on the ſkirts of the mountains after Whitſuntide, for when the ſeed time is over, and the people can be ſpared, they are driven on the ſides of the mountains to Sæters, or to Stols, as the country phraſe is, which at that ſeaſon afford them ſufficient fodder, the ſnow being no ſooner melted than the graſs appears, at leaſt a quarter of an ell high, grown under the maſſes of ſnow, from which it derived both warmth and moiſture When the diſtance is within a Norway mile, the milk is brought home twice a day, but if the diſtance be two or three miles to thoſe paſtures, they keep Saterboe or huts on the mountains, where a maid-ſervant, diſtinguiſhed by the name of Buedye, conſtantly lives, for the ſecurity of the cattle againſt wolves, bears, lynxes, and other wild beaſts, who generally fly from ſuch a weak keeper She is at the ſame time employed in making butter and cheeſe, with which ſhe goes down to the houſe once or twice a week Regulations againſt diſputes and quarrels with neighbours or borderers, concerning this general right of common on the mountains, are laid down in the Norway Statute-book †

† According to Dr Shaw, both the milk and fleſh of the eaſtern cattle, fed on the mountains are the beſt, beſides, that thus the whole country is turned to uſe, another conſiderable benefit is, that the milk of cattle thus fed is much fatter and ſweeter, as the fleſh is likewiſe more palatable and nutritive Travels to the Levant, Tom II chap iii p 62

The graſs in the vallies, or near the houſes, is cut for hay, and though in moſt places it be mowed with a ſcythe, yet in ſome, like the grain, it is reaped with a ſickle, after which it is hung to dry on heſgiers These heſgiers are a moveable garden, conſiſting only of poles faſtened together, both in the length and breadth, by birch twigs, where the hay dries much better, and the rain evaporates ſooner, than when left to lye on the ground * The peaſant dungs his meadows as well as fields, though the former but ſlightly When the moſs is grown ſo high, as to obſtruct the growth of the graſs, whereby very great damages are done in many places, the experienced huſbandman is not without a remedy, either plowing up the meadow to deſtroy the moſs, or ſtrewing it over thick with ſand, if any can be had in the neighbourhood But according to the before-mentioned Mr Peter Schroder, who is a very experienced huſbandman, nothing is more certain and effectual for this purpoſe, than turf-aſhes, where turf is burnt, or in a woody country to burn turf merely for the ſake of the aſhes, and lay them on thick over the meadows, which are thus damaged by the luxuriancy of the moſs. For the firſt year indeed this method makes no great alteration, but in the following it is recommended by the moſt happy effects, producing the fineſt and melloweſt graſs, intermixed with many ſalubrious flowers The ſeveral kinds of greens growing here beſides the common ſort, are holly, quick, wild tanſy, ruſhes, ſedge, gooſe-oats, bienſen, (ruſhes) ſheer-graſs, iglegras, ſtoergras, (large graſs) or tourgras, of which ſome particulars ſhall be obſerved in the ſequel.

I am not acquainted with the kind of graſs or plant with ſhort broad leaves, to which ſome here give the name of Viola Canina, but by it, and ſome leaves of ſorrel, the lives of two brothers were wonderfully ſupported for ſeveral days. The ſingularity of this ſtory is ſuch, that I cannot forbear inſerting here a ſhort abſtract of it, for however it may appear a digreſſion, yet it is not very unuſual, in an account of the ſeveral plants of a country, and it is beſides an intereſting fact, as it furniſhes more than one inſtance of the care of providence over perſons in the extremity of diſtreſs It may be read more at large in Oluf Bangs collections, p 508.

* I have ſince been informed, that theſe Hœſgier are uſed only in the dioceſe of Bergen, they not being ſo neceſſary in other parts, where the rains are not ſo frequent

Olaſe

Olave and Andrew Engelbrechtſen, born in the farm-houſe of Toxen, in the pariſh of Guldſdal in Gulbrandſdal, brothers and ſtudents, ſet out on the firſt of Auguſt, 1652, from the ſaid houſe of Toxen, to take the diverſion of ſhooting and fiſhing for a few days, in the high mountains, which ſeparate Guldbranſdal from the province of Valders On the ſecond of Auguſt, after proceeding about four Norway miles, they came to a large water called the lake of Ref, where they ſtayed four days On the ſixth of Auguſt they were for returning home, but firſt rowed away to a very ſmall iſland in that lake, being but ſixteen paces long and half as broad, to draw up a net which they had ſpread there Whilſt they were on this iſland, by a ſudden ſtorm at eaſt, their ſkiff broke looſe, and was carried over to the other ſhore, by this accident, as neither of them could ſwim, they ſaw themſelves in extreme danger of periſhing with hunger After having faſted the firſt day, they were for the ſpace of twelve days, deſtitute of any kind of ſubſiſtence, except only the wild vegetable, which introduced this ſtory, the Viola Canina and ſorrel Beſides hunger, they had alſo ſevere winds and colds to ſtruggle with, eſpecially in the night, and being but thinly cloathed, as their travelling neceſſaries were on the banks of the lake, they muſt ſoon have periſhed with cold, had not the invention of one of them ſuggeſted to build a little hut of ſtones, where they might in ſome meaſure be ſheltered from the weather Their next care was to ſearch, if this little ſpot did not afford ſome ſucculent vegetables, their appetite now beginning to grow keen towards the end of the ſecond day, but their firſt ſearches were fruitleſs, at laſt they alighted upon a kind of broad leaved graſs, without doubt Viola Canina, of which, twice a-day, each ate about an ounce, that being all they could find at one time, and as in this extremity they frequently implored the aſſiſtance of heaven, ſo their ſlender repaſts were conſtantly attended with a prayer They tried alſo the leaves of ſome buſhes but found them too bitter After thus devoutly eating their pittances of that graſs, their ſpirits and ſtomachs were refreſhed, and the acute pains they felt in their arms and ſhoulders abated But the moſt remarkable circumſtance in this ſuſtenance was the happy proportion in which it was dealt out to them, and the ſudden reproduction of it, for, according to their own account, which they

A remarkable ſtory

themſelves publiſhed, from a principle of gratitude to God, and conſequently cannot be ſuppoſed to have adulterated it with a deliberate falſhood, they daily found no more than the above-mentioned very ſmall portion, on the following day, their ſearch was duly anſwered, though they had but the day before torn up all the other graſs, and the moſs itſelf, to form a kind of a bolſter, in their ſtore-hut, and towards the period of their miſery, they met with more than at firſt, but on the twelfth day, when their deliverance was at hand, this eſculent entirely failed them, ſo that not a blade of it was to be ſeen But on that day they met with ſomething, which had hitherto eſcaped their eyes, tho' their ſearch was confined to ſo narrow limits This was a little ſpot, all overgrown with ſorrel, which they cleared, and fed on it with a devout cheerfulneſs, yet, when in the evening Andrew Engelbrechtſen crept thither, being unable to walk, he found it freſh grown It may be ſurmiſed, that this was another ſpot which had not been touched, but to obviate this, he ſays, that they had taken exact notice of the place, having obſerved a piece of wood lying near it In the mean time, theſe diſtreſſed young men, did not give up all hopes of being delivered by ſome perſons who might reſort, as many did, to theſe deſart mountains for the diverſions, which had drawn them thither The inſtrument which providence made uſe of for their preſervation was their dog, who after continuing eight days with their little baggage on the ſhore, had returned home howling and moaning From the grief of this faithful creature it was concluded they had met with ſome misfortune, and a man was immediately diſpatched to the mountain in ſearch of them, coming thither on the eleventh day, he could get no ſight of them, but found their clothes, &c and from ſeveral marks, he conjectured they had not been there for a conſiderable time, upon which he immediately returned with the melancholy news, that they were probably drowned On the twelfth day, being the 17th of Auguſt, Olive Engelbrechtſen, appearing to be at the laſt gaſp, his heart throbbing with a violence ſo as to be heard, they ſunk into deſpair, and Andrew, the younger, with what remains of ſtrength he had, cut out on ſome pieces of timber which were moſt in ſight, a conciſe relation of their unhappy caſe, and the text, upon which he thole their funeral ſermon ſhould be preached,

Pſalm

Pſalm lxxiii. ver 22 and 26 After this they mutually encouraged each other in the hope of eternal felicity, to patience, and perſeverance in faith, jointly recommending themſelves to God, and totally deſpairing of all temporal relief, ſince the above-mentioned herb had ſailed them But in the night between the twelfth and thirteenth day of their famine, being the eighteenth day of Auguſt, their hearts were revived, by the ſound of horſes galloping up the mountains, upon which they called out, and being heard, the riders flew to their aſſiſtance, and putting off in their boat, which, as another inſtance of God's paternal care, had received no damage, brought them aſhore Food being offered to them, the elder brother could eat very little of it, and the little he did eat, threw him into ſuch a diſorder, as after his return home confined him eight days to his bed, however, he ſurvived it thirty-ſeven years The younger brother found himſelf leſs incommoded, and in the year 1691 drew up this relation, particularly thanking God, that their dog, the ſubordinate means of their deliverance, had not ſwam over to them when they called, and made all the ſigns imaginable, with a view of killing him for their ſuſtenance I beg pardon for this digreſſion, and reſt the truth of the fact upon the authority of the party himſelf.

SECT XI

All kinds of eſculent and garden vegetables

After thus treating of grain and graſs, the chief ſuſtenance of men and other animals, the culinary and garden vegetables are the next in order for our conſideration The common people here, and eſpecially in the country, have very little taſte for theſe, and even the towns and cities uſed to be ſupplied from England and Holland with cabbage, leeks, and other roots But in this century, eſpecially within theſe forty years, a foreign ſupply is become leſs neceſſary, as gardening grows more into vogue, for which the country is partly indebted, to a very uſeful little piece, intitled, The Norway Horticulture, publiſhed at Drontheim, by Chriſtian Gartner, and a happy experience has ſhewn, that all kinds of eſculent vegetables thrive in our gardens, they produce cabbage of all kinds and colours, green, white, or red, likewiſe green peas, common and french beans, aſparagus, artichoaks, melons, cucumbers, garlic, parſley, ſellary, marjoram, thyme, ſage,

ſage, penny-royal, purſlain, ſorrel, lettuce, ſpinnage, endive, creſſes, chairvil, dill, fennel, and cummin, the laſt growing wild, eſpecially in Nordenfield, accordingly it has no place in gardens, increaſing ſpontaneouſly to ſuch quantities, that from Chriſtiania, it is exported abroad Our gardens likewiſe furniſh us with all kinds of roots, as yellow, red, and common carrots, parſnips, radiſhes, potatoes, together with a particular kind of northern turnips called Naper, which the peaſants endeavour to raiſe more than any other, and ſell by tuns in the cities Theſe are ſometimes very large, and as flat as a diſh A man of veracity has aſſured me, that not many years ſince, he had in his garden one of theſe Napers, weighing twenty-ſeven pounds They keep beſt in the little hillocks to be met with among the ſwamps, where they continue entirely freſh, even ſo late as ſpring time

In order to forward the growth of certain vegetables, where the ſummers are ſhort, the example of burgo-maſter Jurgens of Drontheim, is recommended to imitation in the above-mentioned Horti Cultura, p 23 This gentleman, at harveſt time, ſet in his garden at his ſeat of Harli, ſeveral plants, which might be ſown early in the ſpring, but which being covered by the ſnow during winter, were alive, and very forward in ſpring But this method, however adviſeable in the inland parts of the country, will not hold good in the maritime parts, for want of ſuch laſting ſnows, the winters here being rather wet than cold

CHAP V

Account of the Vegetables continued

SECT I *Medicinal and other plants and flowers* SECT II *Noxious herbs* SECT III *Wholſom and palatable berries* SECT IV *Of the Norway woods in general* SECT V *A catalogue of Norway trees* SECT VI *Moſs upon the trees and ſtones*

SECT. I

Medicinal and other plants

FROM the common eſculent vegetables, I come to treat of ſeveral other kinds of plants and flowers, which Norway affords, ſome ſalubrious, others agreeable to the ſight or ſmell, ſome planted in gardens, others growing wild, and I ſhall gather my informations either from books, eſpecially that of the accurate Mr Ramus, or from the epiſtolary correſpondence I enjoy, with perſons of parts and candor Among the written helps, I muſt acknowledge the preference due to an Herbarium Vivum, written by Mr Godfrey Henry Langen, who, for various purpoſes, but particularly to acquire a knowledge of the Norway plants, hath viſited ſeveral provinces, making ſome ſtay in Nordland, an hundred Norway miles beyond Bergen * From theſe authorities, I have ſet down the following, with remarks where I thought them proper and requiſite, omitting remarks upon thoſe plants that are common and generally known.

Abſinthium maritimum (likewiſe pratenſe) Sea-wormwood

Acetoſa major, minor, fontana Sorrel

Acetoſella Petty-ſorrel, ſheep-ſorrel

Aconitum magnum Wolfsbane

Adiantum aureum Golden maidenhair

Agrimonia Agrimony, liver-wort

Alchimilla f pes leonis, item minor mathioli, ſolius diviſis et ſubtus albicantibus Ladies mantle, Pa-de-lion

Allium montanum latifol Sylveſtre, tenuifolium Broad-leaved mountain-garlick This, in ſome places, is ſo intermixed with the graſs, that it gives a diſagreeable taſte to the milk, as if

* This Herbarium Vivum, is the more valuable for the lively freſhneſs of the colours of the ſeveral plants and flowers, beyond any thing of the kind I ever ſaw, but whether this be the effect of the air, or of the plants themſelves I cannot determine

garlick had been boiled in it This ſpecies of garlick, has ſome appearance of may-flowers, and is accounted a better medicine for the ſcurvy, than even ſcurvy-graſs

Alſine vulgaris, longifol nemorum hirſuta, folio Euphraſiæ rotundo et crenato, facie ſpergulæ Chickweeds

Althea Marſhmallows

Alyſſon Germanorum Madwort

Anagallis aquatica Brook-lime

Angelica vera officinarum, ſeu Archangelica, grows here and there in the vallies, but delights chiefly in the mountains, where it is as plentiful as in Switzerland The highland peaſant, not only chews it in a morning dried, but likewiſe makes a ſnuff of it The bears likewiſe are very fond of the ſtem till it grows tough and ſapleſs

Anſerina, Argentina, likew e called Potentilla, from its anodyne and vulnerary property Wild tanſey

Anonis non ſpinoſa, flore purpuraſcente Reſtharrow

Anthillis leguminoſa Kidney-vetch, or lady's-finger

Antirrhinum anguſti fol cærul item flore luteo. Snap-dragon, or calves-ſnout

Aparine et gallium album Cleavers, and white ladies-bed-ſhaw

Apios Hieron Bock Earth-nuts

Apium paluſtre, et Sylveſtre Smallage

Aquileja flor carul ſimpl Columbines

Arnica Zogeri lupi Motherwort It is in great uſe among the Norw y peaſants, againſt pains in the back or limbs, a decoction of it in ſtale beer operating by perſpiration

Artemiſia vulgar it tenuifol Mugwort, or white-wort

Aſperula odoriferi Woodroof

Aſphodelus paluſtri luteus Kingſpear

Aſtragalus flore flavo, radice bulboſa Silk-vetch, or wild tares

Aſtrantia Sylveſtris, aquatica, fol anguſtis, parum hirſutis Black maſterwort

Atriplex major, minor, maritima, fol ſcutato, fœtida White and ſtinking Orache

Auricula muris Mouſe-ear

Barba

Barba caprina, S Tragopogon, fl luteo Goats-beard
Bardana Burdock
Bellis major, Buphtalmos Ox-eye
Betonica Betony.
Bifolium, latifol ſine teſticulis et palmis Tway-blade.
Biſtorta minima Small-biſtort, or ſnake-weed
Bonus Henricus Engliſh Mercury
Branca urſina, Branckurſine Bears-breech
Braſſica Sylveſtris, S Lampſana fol integr et laciniatis Nipple-wort
Bryonia Bryony, Hedge-plant.
Bugloſſa vulgar it maritima Bugloſs, or ox-tongue This plant grows along the ſhore in Northland, ſo as to be often over-flowed, and thereby contracts a ſaline taſte Its leaves and ſtem nearly reſembles purſlain, and it runs along the ground to a great diſtance Mr Lange does not mention his having ſeen it any where elſe It is a good vulnerary, and corrects the motion of the blood
Burſa Paſtoris Shepherds-purſe Experience ſhews it to be an excellent medicine for attenuating the blood, and abating a fever

Calamus aromaticus
Caltha paluſtris Marſh-marygold The Norway peaſants, judge by the appearance of this flower, when to turn their cattle to graze
Campanula major et minor cærul Hedge-bells
Caprifolium Honeyſuckle, woodbind See Periclymenum
Carduus aculeat et non, caule angulari et ſpinoſo, it folio lævi lacteſcente, it maritimus, it pratenſis flore purpureo et albicante Thiſtles of different ſpecies, ſome of which bear corn, which in a time of dearth, may be grinded and baked inſtead of bread, and thus the curſe, *thorns and thiſtles ſhall it bring forth to thee*, is amongſt us converted into a bleſſing When the thiſtle-tops are full, the peaſant depends upon a good harveſt
Caryophyllata, flore nutante, it flore luteo, radice odorata The herb avens, likewiſe called the herb of St Benedict
Caryophyllus maximus Sea-gilliflower

Cauda muris Mouſe-tail.

Chamæmelum vulgare Camomile.

Chamæbalanus Pignuts

Chelidon ium majus flore luteo et min f rotundo Celandine, or ſwallow-wort

Cherefolium Chervil.

Chryſanthemum ſegetum Corn-marygold

Cicuta Hemlock

Cicutaria Baſtard-hemlock

Cochlearia Scurvy-graſs This grows every where in Norway in great plenty, and of ſeveral kinds, as, repens et furgens, ramoſa, punctata, et nen punctata, it. folio crenato et inciſo, particularly the Cochlearia maritima, which grows along the ſhore, and from the ebb and flood undergoes an alteration, being alternately wet and dry Its leaves are ſmall, round, and thickiſh, and are juſtly eſteemed the ſovereign anti-ſcorbutic, and the further north it goes, the greater its value, in the ſpring the leaves are very ſmall, but ſowing itſelf again in the ſummer, its leaves towards winter are large and juicy.

Conſolida major Black-root, or comfrey This, in ſome places, grows wild

Conſolida aurea Another vulnerary herb, uſed for conſolidating wounds

Convolvulus major et minor Great and ſmall bin-weed.

Conyza major Greater fle a-bane

Coriander Coriander

Coronopus maritimus Sea-plantain

Cotula fœtida et non fœt Sweet and fœtid wild-camomile.

Criſta galli Cockſcomb

Chriſtophoriana, fol Ranunc Crow foot-leaved, herb Chriſtopher

Crocus Saffron

Cuſcuta Dodder

Cyanus Bluebottle

Cynogloſſ. flor caerul et purp Hounds-tongue.

Cupreſſus ſylveſtris Wild-cypreſs

Dens leonis Dandelion

Digitalis flore albo et vario. Foxglove.
Doronicum Leopard's-bane
Dulcamara S amara dulcis S solanum scandens. Bitter-sweet
Echium, facie Buglossæ it. scorpioides majus et minus, flore cærul Vipers-bugloſſe, and greater and leſſer mouſe-ear Scorpion-graſs
Equisetum ramosum et non Horſetail
Erisymum Hedge-muſtard
Eruca sylvestris flore luteo Wild-rocket
Esula vulgaris et major Great-ſpurge
Eupatorium canabinum Hemp, agrimony
Euphrasia Eyebright
Filix mas et fœmina, mollis, cornuta Several kinds of Fern
Filicula aperta, ramosa, florida Oſmund-royal, and other Ferns.
Filipendula Dropwort
Flos Africanus African marygolds
Flos Trinitatis Harts-eaſe
Fænum Græcum sylvestre flor luteo Wild-ſenugreek.
Fæniculum Fennel
Fritillaria variegata Fritillary.
Fumaria latifolia Fumitory
Galeopsis major et minor Hedge-nettle
Gallitrichum Sylvestre Wild Clary
Gallium flore albo White Ladies-bedſhaw
Gentiana Gentian, grows in great quantities; is ſuch a bitter, that when eat by the cattle, with whom it is a favourite root, it communicates its taſte to the milk, but withal makes it particularly wholeſom
Gentianella Baſtard-gentian
Geranium grumum, caule rubic it sylvestre fuscum, it flore cærul Several kinds of Crancſbill
Glyzyrrhiza siliquosa Liquoriſh An infuſion of it in brandy is uſed as a cordial among the peaſants
Gnaphalium flore vario Lions-foot, or ſea-cudweed
Gramina diversa Many kinds of graſſes
Hedera terrestris Ground-ivy
Helleborus niger Black-hellebore, bears-foot, ſetterwort

Hepatica nobilis Noble liverwort

Herba Paris quadrifol Herb true-love

Herba flammula jovis Spearwort A peſtilential herb, pernicious to the cattle in thoſe parts, where it grows plentifully, particularly occaſioning tumors in their mouths

Herba mercurialis Mercury, or dogs-cole.

Herba trientalis fl albo White trientral

Herniaria Rupture-wort

Hieracium facie dent leon it hirſutum, laciniatum, minus ramoſum, ſpinoſum, alpinum Hawk-weed

Hirundinaria Swallow-wort

Hiſpidita, ſi pes cati Several kinds of cats-foot.

Hyacinthus racemoſus juncifol Hair-bells.

Hyoſchiamus albus et niger. Hen-bane

Hypericon vulgare, it minus ramoſum St. John's-wort. It is adminiſtred here both inwardly and outwardly, in many caſes, and with very good ſucceſs.

Hyſſopus Hyſſop

Jacea nigra, fol purpureo Knap-weed, or mat-fellon.

Impatiens ſi noli me tangere. Touch me not.

Imperatoria Maſter-wort

Iris paluſtris fl cærul et luteo Bulboſa, gladialis Flag-flower.

Juncus varii generis Several kinds of Ruſhes.

Lagopus Hares-foot

Lamium purp et alb Dead nettles

Lapathum, acetoſum, it aquaticum minus Red and white Sorrel, and water-dock

Lappa perſonata Great-burdock

Lavendula Lavender

Laureola, fol deciduo, baccis atrovirentibus Surge-laurel.

Lens paluſtris Duckweed

Lilium convallium, it minus, f bifol Lilies of the vallies, theſe flowers are ſucceeded by a ſpecies of berries, ripening about harveſt, in colour and figure like ſmall cherries, of a grateful bitter, an infuſion of them in brandy is by ſome accounted very wholſom

Linaria fl luteo Toad-flax

Lithoſ-

Lithoſpermum vulgare. Grummell or graymill.

Lolium Darnel, and from its cauſing vertigos called in Norway Svimling.

Lunaria vulgar, et racemoſa Moonwort.

Lupinus fl albo, cœrul luteo. Blue and yellow Lupines.

Lupulus ſylveſtris Wild hops

Lychnis latifol glabris, fol. purpur. it fol. hirſutis, fl albo, et purpureo, it viſcoſa flor purp it parva ſaxatilis fl candido it minima fl albo Campions of ſeveral kinds

Lycopodium, officinar Wolfs claw-moſs.

Lyſimachia lutea ſpicata, it vario flore, ſpicata, galericulata. Yellow and hooded willow herb

Malva hortens fl luteo ſylveſtr. criſpa. Yellow and other Mallows

Marrubium nigrum Black hoar-hound.

Matricaria Fever-few.

Melilotus vera Melilot

Meliſſa turcica Turkey-balm.

Mentha arvenſis hirſuta Field-mint; criſpa, curled-mint; aquatica, water-mint

Millefolium Yarrow, milfoil

Morſus diaboli, ſ. ſucciſa folus glabris, it. fol. parum hirſutis. Devils-bit uſed here for dying yarn green.

Morſus gallinæ Chick-weed.

Myrica Tamariſk, this herb though known to be extremely heady is made uſe of in brewing by ſome peaſants, and ſupplies the place of hops in their liquor.

Narciſſus Daffodil

Naſturtium, varii generis, agrarium, aquaticum, pratenſe, minus ſcutatum, pumilum Creſſes of ſeveral kinds.

Nigella Fennel-flower

Nummularia ſylveſtris repens fl albo. Money-wort To this tribe probably may belong a Norway-herb, the name whereof I never could learn, but it deſerves notice, a tea being made of it, which is a noble pectoral, its leaves are nearly orbicular, with a very ſmall inciſion, at the fore part, being but half as big as a Daniſh ſhilling, and growing by pairs on a long, thin, round and hairy ſtalk, its flowers are little campanulæ, or bells of five leaves, white on the outſide, but their inſide beautifully variegated with

with red ſpots The before-mentioned Mr Lange, a perſon of univerſal experience and curioſity in botany, affirms, that he never met with it out of Norway, and recommends it for pectoral diſorders

Nymphæa alba, lutea, it fl unifol White and yellow water-lily, its root is uſed in many caſes

Ocymaſtrum, flore albo et purpureo Wormgraſs

Omnifolium Leaf-wort

Ononis ſpinoſa et non Reſtharrow, prickly, and not pricky.

Ophioglooſſum Adders-tongue

Orchis latifolia, flore albo, binis et uno teſte, it tenui fol. fl albo Several kinds of ſatyrion

Origanum Wild marjoram

Oxytriphyllon Sheep-ſorrel

Pæonia nobil Male pioney

Papaver, cratic et hortens Wild and garden poppey.

Parietaria Pellitory of the wall

Paſtinaca ſylveſtris, latifol et tenuifol Wild parſnip

Pedicularis Red rattle

Pentaphyllum petræum, paluſtre, repens Cinqfoil, or five-fingers, ſeveral kinds

Periclymenum parvum Little Woodbine, called in Norway devils-berries, the eating of them being pernicious, on which account, I have omitted them in the different ſpecies of berries, which I ſhall ſpeak of in the ſequel *

Perfoliatum Thorough-wax

Perſicaria maculoſa et non, it aquatica Arſmart ſeveral kinds

Phu vulgare Common valerian

Piloſella repens Common mouſe-ear

Pimpinella ſaxifraga, fol rotundo it prof inciſo Pimpernel ſaxifrage

Pinguicula Butter-wort

Piper aquaticum Water-pepper So the ingenious Mr Lange in his herbarium vivum, calls this vegetable, ſaying at the ſame time, that he never met with it any where but on the ſea-coaſts

* John Chriſtopher Buxbome makes this vegetable originally a native of Norway, in a little memoir concerning it, which is to be found in the Commentar Academ Petropol Tom , p 268 with this title, De Periclymeno humili Norvegico Simon Paulli in his Flora Danica p 37 mentions it under the name of Caprifolium, Woodbine annexing a good advice to thoſe who are for making a medical uſe of it

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in Norway, and that he gave it this appellation on account of the taſte of its leaves, which are of a middling length and breadth, rounding towards the end, with ſmall carnation flowers with ſeeds in the calyx like the ſemen pſylli

Plantago major, caule ſpicato et capitato, minor latifol. it. longifol. it hiſuta, it aquatica Several kinds of plantane

Polium montanum Mountain-poley

Polygala fl cæruleo Milk-wort

Polygonatum latifol it anguſtifol Narrow, and broad-leaved Solomon's-ſeal

Polygonum Knot-graſs

Polypodium Polypody, wall-fern

Potamogeiton Pondweed

Primula veris fl cæruleo Blue Primroſes Poſſibly Norway is the only country which produces them of this colour

Ptarmica hortenſis Sneeſe-wort.

Pulmonaria Lung-wort

Pyroli ſpicata florida et minor uniflora Two kinds of winter-green

Radix roſea Roſe-root However ſcarce in other parts, here it grows ſpontaneouſly, and beſides its fragrancy and ſightlineſs, is highly ſerviceable in the ſcurvy, though this property of it be little known

Ranunculus, varii generis, vulgar et dulc fl luteo, it fl. globoſo, it paluſtris, it vernus, ſeu anemone fl albo ampliſſ it. iquatic fl albo Several kinds of Crowfoot

Rapiſtrum agreſte Charlock

Rapunculus vulgar Rampions

Regina prati ſ ulmaria Meadow-ſweet

Reſeda marina lutea Yellow Baſe-rocket

Rhamnus ſolutivus Buck-thorne

Ros ſolis, roſa ſolis

Ruta hortenſis Garden-rue

Sabina ſylveſtris Savin, uſed by the peaſants as a dye

Salvia ſylveſtris et hortenſ Sage

Sanicula alpina Sanicle

Saponaria maj et min The greater and leſſer Soap-wort

Satyrium latifol flor purpur et tenuifol. it. maculat. Three kinds of orchis

Saxifraga aurea Golden ſaxifrage

Scabioſa hortenſ et vulg Scabious, an herb applied to ſores and impoſthumes

Scorzonera Vipers-graſs.

Scrophularia Fig-wort

Sedum majus, it vermiculare fl lut et albo. Great and little Houſe-leake.

Sempervivum Wall-pepper

Senecio, ſ. erigeron Ground-ſell

Serpillum Mother of thyme

Sideritis heraclea Iron-wort

Sigillum ſolomonis Solomons-ſeal

Sinapi agreſte Wild muſtard

Siſymbrium aquat Water-creſſes

Sonchus aſper laciniat fl lut it lævis lacteſcens, it latifol fl cærul Three kinds of Sow-thiſtle

Sophia chirurgorum Flix-weed, a vulnerary herb.

Spina criſpa The barberry-buſh

Spinachia Spinnage

Stæchas Silver-knap-weed.

Tabacum Tobacco In the dioceſe of Aggerhuus endeavours have been uſed for the cultivation of it

Tanacetum album White Tanzy It vulgare fl luteo. Common yellow Tanſy

Taraxacum minus Leſſer dandelion

Telephium ſ craſſula Orpine

Teucrium pratenſe, it minus Wild-germander

Thalictrum Meadow-rue

Thlaſpi ſcutatum, it minus, acerrimum Two kinds of treacle muſtard

Tormentilla Tormentil

Trichomanes ramoſa Branched-maidenhair.

Tricolor ſpec viola Panſies or hearts-eaſe

Trydactylites alpina, filicis genus Fingered-fern

Trifolium var gen acidum fl albo, it aquatic fibrinum, it corniculatum, it hepatic aut fl. cærul it pratenſe fl minuto albo, it rotundifol flor purpur Seven kinds of trefoils

Tuba rubra Turcica Turkiſh trumpet-flower

Tubera var gen Truffles, ſeveral kinds

Tulipa

Tulipa var. col. Various tulips

Tunica Pinks

Tuſſilago, ſ ungula equina fl luteo Coltsfoot: Dr Lockſtor thinks its effects are like thoſe of tobacco, and that it might be a good ſuccedaneum to it, but beſides the common Coltsfoot, here grows alſo another different from the other in the ſhape of the leaves, being tapering and very narrow towards the ſtem Mr Morten Ruus informed me, that the latter were particularly beneficial for recent wounds, the peaſants, when eſpecially in harveſt-time they happen to cut themſelves with a ſcythe, apply nothing but this herb to the wound, which it cloſes as it were inſtantaneouſly

Valeriana græca maj et minor Greek Valerian, the greater and leſſer

Verbaſcum mas et fœmina, candid et nigrum, Mullein, white and black.

Veronica maj min, et minima, ſaxatilis Speedwell, it is alſo called Norway-tea, and grows every where in great plenty

Viola matronalis, alba et aurea, it ſylveſtris fl luteo Dames violets, the garden and wild

Umbilicus veneris caule ſanguin fol linguar. Red ſtalk d Navel-wort

Unifolium One-blade

Urtica maj et min mortua fl albo Nettles, and dead nettles

In the before-mentioned Herbarium vivum, there are above twenty more very ſightly flowers and herbs, which the collector Mr Lang, was at a loſs under what kind of known exotics to place, and much leſs has he preſumed to give them any name. I ſhall mention ſome others preſently, which I have had ſeveral opportunities of knowing, previouſly obſerving, that the foregoing liſt, is a manifeſt evidence, how the infinitely wiſe Creator has abundantly furniſhed this land with ſuch plants and herbs, as the diſeaſes of the inhabitants moſt require The diſtempers, eſpecially towards the ſea-coaſt, being ſcorbutic, there accordingly, as has been obſerved, grows not only angelica, roſe-wort, and gentian, preferable to any in Europe, but likewiſe ſeveral other kinds of excellent creſſes, trefoils, ſorrels, and ſcurvy-graſs Among the latter, Mr Chriſtopher Steinkul, ranks Erich's graſs, a thick leaved herb

The herbs of this country adapted to its diſeaſes.

herb, of which I had never heard before, which is to be found in great plenty on the iſlands of Northland, and of which the inhabitants of the continent are ſaid to fetch away boat-loads, preſerving it in tuns for winter proviſion, as a ſuccedaneum to cabbage

SECT. II

I now, purſuant to my promiſe, proceed to give an account of ſome vegetables growing in Norway, which are little, if at all known out of this country, but are chiefly noxious In the pariſh of Vaage in Guldbrandſdale, particularly in the chapelry of Sel, and poſſibly in more places *, though unknown to me, grows a very ſingular and poiſonous root, ſometimes longiſh and knotty, ſometimes rounder, and generally of the thickneſs of a half-crown The leaves are a ſpecies of graſs, reſembling ſedge, the name of it is Selſnape, whether, as ſome think it be the water-parſley of the Germans, or whether Mr Ramus more juſtly ſtiles it Aſtrantia ſylveſtris aquatica, Maſterwort, I ſhall not determine, eſpecially as the worthy author himſelf ſpeaks with diffidence, ſaying, Aſtrantia forte eadem, quæ aliis Selſnape, et forte ad cicutæ genus referenda † Such is the force of its poiſon, that if a beaſt happens to eat any of it, which they are very apt to do, he dies immediately, his belly burſting, and the very fowls who prey upon the carcaſe, ſoon after drop down dead, as is particularly related in a letter of colonel Reiſhwein to doctor Simon Paulli, which is to be met with in the Acta Medica Phil

Vol II p 129 Hafnienſ Th Bartholin ‡ A learned friend of mine has communicated to me a copy of a letter which he lately received from a clergyman, where, in compliance with his deſire, he gives him

* Mr Ramus thinks that Oere land is the chief place where they grow, but this proceeds from his miſtaking them from Gramen oſſifragum, which will be ſhewn to be a very different thing

† In a letter of my learned predeceſſor Fr Portoppidon to Simon Paulli, dated April 167, I find this herb to be alſo called Sprengrod his words are theſe " Exhibeo tum ratio ubi herbam illam, quæ Sels Næpe et Sprengerod appellatur " This laſt name unqueſtionably alludes to its poiſonous quality

‡ Vol II p 128 Similis eſt Apionis, ſed radices habet craſſis et nodoſis inſtar radicum ſeu raparum Botteldianarum Si beſtia ut equus, vacca, bos, ovis vel porcus illam devoret (cujus tamen appetunt eſcam, unde ruſtici, ubi hæc herba creſcit, iſta loca circumſepiunt, in quibus copioſe luxuriat) ſtatim moritur et diſrumpitur Venenum ejus quoque tam vehemens, ut avis, ſi cadaveri involet, prius concidat confeſtim, et ſi inde repellatur, ſtatim ex aere decidit mortuaque Hanc plurimam hujus regionis incolæ appellant, Syll naplet

him

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part 1

Branch of the Oxel Tree p. 146

Stiv grass p. 128

Torbee p. 131

him a more accurate tho' not compleat account, of its good and bad effects in the following words: "This plant derives its name from the place of its growth, which is here in Guldbrandſdale, in the pariſh of Waag, and the chapelry of Sels. It delights in ſwampy places, and begins to ſhoot towards the cloſe of June, or the beginning of July, when the ſwamps are entirely dryed. It bears a kind of graſs like the Norway Maſterwort, and its root is about the circumference of a half-crown, ſome round, others oblong, as in the figure. None of the ſeveral medicinal dictionaries, which I have ſearched, mention either its uſe, or ſo much as its name, poſſibly from its being unknown to the authors, tho' a certain writer of Magdeburg ſpeaks of the Apium rannum, which he interprets water-parſley, in the following manner; Affectat ovicula ex paludibus apium rannum, cum tamen inter ovem et hanc herbam talis ἀντιπαθία ſit, ut ovicula ſtatim moriatur, et in ſignum mortis ex Apio comeſtæ, in hepate ovis reperiatur veſtigium inſtar folii de Apio jecori animalis quaſi impreſſum. Which deſcription evinces water-parſley and Selſnape to be the ſame, the latter being preſent death to the ſheep, whereas in ſwine it is known to operate ſo beneficially, that it is the beſt medicine which can be given them. The poiſon of it is equally fatal to men, as the inhabitants of Sels know from many melancholy inſtances, and within my time, two children, having ignorantly eat of it, died ſoon after. Upon cutting a freſh root into ſlices, and throwing it into freſh water, it emits rays of different colours, and this water being put up with the Nape in a bunged caſk, contracts a ſmell more loathſom than any carrion. As to the virtues thereof, it is found to be a ſpecific in arthritic caſes, for which it is uſed in the following manner, being ſewed up in a piece of fine linen, it is faſtened to the ſhirt ſo as to be placed on the part affected, either the arms, the loins, or other limbs, upon its being warmed by the natural heat of the body, the pain is immediately aſſuaged, and without any return, whilſt the Nape remains applied to the body. This is known by taking it off, when the pain immediately returns, eſpecially if the diſtemper be chronical, or if recent, the uſe of this remedy has been known totally to remove the diſtemper within a quarter of a year. Another ſingular virtue has alſo been found in it, an

inhabitant of the above-mentioned hamlet of Sel, had for ſeveral years been afflicted with an inward weakneſs, but whether it proceeded from the ſtomach or the breaſt was doubtful, the man however was in great miſery, and at length confined to his bed, in his impatience he determined, without conſulting any one, to eat a bit of Selſnape, and ſoon found himſelf relieved; upon the return of the fit he applied it with the ſame remedy, which effectually expelled it, and at length he was reſtored to a confirmed ſtate of health, lived ſeveral years after, and this many credible witneſſes can teſtify However, I will not recommend this as a medicine, frequent experience having diſcovered the fatal operation of it, as a poiſon on the human conſtitution This is the ſubſtance of what I know concerning the good and bad properties of the Selſnape"

Another vegetable, pernicious to the cattle, tho' not ſo fatal, growing in the manor of Sundbord, and in other parts of Norway, is a kind of ſtur-graſs, or large graſs, the leaves broad and pointed, with very little yellow flowers, its name among botaniſts is Gramen Oſſifragum Norvegium It has a very remarkable effect on oxen and cows, if they happen to eat of it; their ſtrength totally decays as if their bones were fractured, or rather mollified, that without the ſtrange remedy of adminiſtring to them the bones of other cows, which they devour with the utmoſt greedineſs, they quickly die The before-mentioned letter of that eminent botaniſt Mr Reichwein, to Dr Simon Paulli, contains a deſcription both of it, as well as of the Selſnape. Among other things he ſays, "Comminguit et conterit ſtatim omnia oſſa, ita ut tracti inter pollicem circa bacillum, circumvolvi poſſint Non ſtatim tamen exſpirant, ſed curari poſſunt, ſi illis exhibeamus oſſa contuſa alterius alicujus beſtiæ ex eſu hujus herbæ mortuæ" This laſt circumſtance, that the bones uſed for the cure muſt be of ſuch cattle as have died by eating this graſs, is contradicted in another letter of Mr J Fred Marſchalch, in the above-mentioned work, wherein is this paſſage "Non enim eadem exhiberi illis oſſa animalium eodem gramine occumbentium ſicut Reichwinus beatus ſcribit" A gentleman of this country, who from his own obſervation is acquainted with this ſtur-graſs, and ſent me the original from which the annexed figure was

taken, informs me further of this remarkable particular, that a cow with calf received no damage by eating this grass, tho' such a violent corrosive in the bones of other cows, but whether, according to the above-mentioned expression of Mr Reichwein, they become so mollified that they might be twined round a stick, which (upon the death of such a beast would be no difficult matter to try) he could not venture to assure me And Dr John Treubler, formerly city-physician, in his letter to Dr Simon Paulli *, doubts of it; and as this greatly confirms and throws a light upon this point, I shall not hesitate to transcribe his words from the before-mentioned valuable collection "Mitto unà cau- P 133 seq
lem graminis desiderati in frusta dissectum, ut angustia epistolæ caperetur, quod rustici nostri (quorum hac de re non paucos examinavi) Strotegrass, dicunt, flores flavos jam amisit, plenos fæminibus, adhuc tamen immaturis, locis paludosis et humidis crescit inter alia dumeta, prope omnes villas colonorum primum gramen est, quod vere prodit, unde avida sunt pecora ad decerpendum, quam primum vero alia gramina copiosius prodierint, hoc gramen aversantur, forsan propter caulem durinsculum. Ex esu hujus pecora male habent, macie confecta, spina dorsi extra protuberante (unde rustici dicunt, quod dorsum sit fractum) pedibus ossibusque debilibus, ut ægerrime incedere queant Quod autem prorsus mollia fiant ossa, vix fieri potest, alioquin omnia animalia perirent et humi prosternerentur Pro antidoto rustici semper habent exsiccata ossa in promptu, quæ quotannis conservant ad hunc usum, quando carne prius abrasa usi sunt, eadem quoque ossa in plateis et vedibus colligunt, quæ exsiccata confringunt, et mox ab animalibus magno appetitu, in minima dentibus comminuta devorantur, unde quasi salivatio subsequitur, multum-

* However some naturalists, on the other hand, make no manner of doubt of the possibility of an emollescence of this nature, an instance of which is the following passage from Bibloth Raisonnée de l An 1746, Tome xxxvii p 262 "M Petit a eu bien des combats a soutenir au sujet de l'emollissement des os, que cet habile homme avoit un peu trop crû avoir decouvert le premier Plus de vingt Auteurs avoient decrit avant lui cette cruelle maladie, qui detruit en peu de temps ce que la nutrition, et l'accroissement ont fait en bien des années, et qui remet les os dans le degre de molesse qu'ils avoient eu dans le fetus Monsr Bevin en a donné un nouvel exemple Une femme fut attaquée d'une diabete, qui apparemment avoit extrememment derange les sucs nourriciers, dix huit mois apres ses os s'amollirent, se prêterent a l'action des muscles, et se plierent a tous les mouvemens, que la superiorité alternative des muscles extenseurs et fléchisseurs peut produire

que

quæ aquæ ex ore profluit, ut ftatim melius habeant pecora et paulo poft convalefcant. Alii pro remedio in pharmacopoliis emunt radicem tormentillæ, plerique tamen et pene omnes offibus acquiefcunt. Videtur (quia ruftici rationem nullam dare fciunt) quod pecora plerumque primo vere, terra adhuc humoribus nimiis fcata, ex hoc gramine præcoci tantam in fe humiditatem fuperfluam forbeant et devorent, quæ deinde per *offa* exficcari debet. Unicuique tamen fuum relinquo judicium." That according to this learned gentleman's opinion, the bones of the cows are mollified by nothing but the extreme moifture of this grafs, is what I muft join with Simon Paulli in doubting; yet, I cannot poffitively affent to the opinion of the latter, that the foil where this plant grows muft contain either quickfilver or lead ore, and that it is the mercurial fpirit infinuated into this plant, which thus corrodes and diffolves the bones. But others may form a better judgment of the matter than I can.

Among this clafs of noxious roots in Norway, muft be ranked Iglegrafs; the peafants in many places are very apprehenfive of the mifchiefs of this plant, efpecially in the government of Nordfiord, where they fpare no pains to clear their meadows of it, as it operates on the *fheep and goats by a violent fpafmus* or contraction, of which they die in extreme torture. Its root is large, fhooting up a kind of bufh of thick ftems, or twigs; the leaves narrow, oblong, and indented, with blue flowers at the end of the ftems, which about harveft produce a hollow bud of twice the bignefs of a pea, containing the feed, and fometimes it is found full of worms and other infects. It grows chiefly in a cold, *watery foil*. *I have* compared it *with feveral* figures, and find that it has fome affinity with the Anemone; likewife, according to Lonicer's defcription of it, with the Sideritis or ironwort, except that inftead of white or yellowifh flowers, it has blue. The eating of this plant in fheep and goats, and fometimes, tho' feldom, in cows, is followed by the Virdfygee, a kind of vertigo, the fymptom of which is fuch a contraction of the nerves, towards one *fide, that the neck and head* are violently diftorted towards its hind parts, under which diftortion the beaft continues turning round till it falls, and foon after dies. Sometimes, though not often, a fheep is faved by opening a vein in the neck, whereby

3 the

the head is reſtored to its natural poſition. The relief for a ram or a cow is to perforate its horns, from whence a purulent matter iſſues.

Another kind of noxious plant is known under the name of Tourgraſs, which is probably derived from its effect, the word ſignifying the magic, or bewitching graſs, it conſiſts of long thin ſtalks, extending themſelves upon the ground, with little roundiſh leaves about the bigneſs of a Daniſh-ſhilling, in other reſpects like mouſe-ear This plant affects horſes and cows with an unuſual torpor, or a kind of lethargy, ſo that the moſt mettleſom horſe immediately hangs his head, and becomes ſo dull and tractable, as to be managed at will It is a known practice among jockeys, when riding together to a fair, to watch an opportunity of conveying ſome Tourgraſs into the mouth of another's horſe, if he chances to be ſo much preferable as to prejudice the ſale of the latter The reſource of the peaſants againſt this diſtemper, and others incident to horſes and cattle, is either caſtoreum, or a piece of an adder, put into dough, and thruſt down the throat of the beaſt If it be not the adder's head, but ſome other part, then the adder muſt be killed before midſummer, and be ſet apart for this uſe

In ſome places, particularly in Hardanger, the mountains produce a plant not unlike rue, but with fewer leaves, called Torboe, likewiſe Heſte-ſpring (the horſe-plant) from its particular fatality to horſes, and it is only in extreme hunger that they will touch it. Upon the firſt ſymptoms of having eat any of it, a ſtrong purge of yeaſt, or any other cathartic, generally relieves them, or likewiſe violent exerciſe, to breath them; without this relief, they are immediately ſeized with a prodigious ſwelling in their belly, and a kind of lethargy This herb, which is flatulent in the higheſt degree, is no wiſe detrimental to cows, ſheep, or other ruminative cattle, as in chewing their fodder they draw in the air There is in Vaas a plant called Turte, and from the little difference of the name, and the ſimilar torpid effects, for which the poor creatures are often miſuſed by the inconſiderate peaſants, I was inclined to think it the ſame as the former, but being very well acquainted with the Torboe, having an exact draught of it, I find no manner of reſemblance betwixt it and the Turte, which Plate IX fig c

has much of the appearance of Angelica The Bears are ſaid to be extremely fond of it, and when by exceſſes in eating of it, they contract an oppilation, they ſeek for relief from the fleſh of animals Mariahaand and Fandenſhaand, i e Devils-hand, are two roots ſomewhat reſembling a hand with five fingers, but diſtinguiſhed by their colour, the laſt is black and uſeleſs, and the firſt white, and good for ſore heads, and other eruptions in children

I ſhall cloſe this ſubject of the plants in Norway, and their ſimilarity with the plants, in other mountainous countries, with the following paſſage from the celebrated Linneus, " thoſe mountains which reach the upper region of the air, and the ſurface whereof are continually covered with ſnow, produce their peculiar plants, of which the Alps in Switzerland, in Wales, the Pirenees, the Olympus, Baldus, and Arrarat, are inſtances, the like not growing in lower ſituations, as may be ſeen in Flor Lappon The plants are no where ſo expoſed to ſtrong concuſſions of the wind, as on the mountains, by which the growth and maturity of them is conſiderably accelerated This is an expedient of nature to ſupply the ſhortneſs of the ſummer Tournefort, in his hazardous aſcent to the top of mount Arrarat, at the foot of it, met with the ſame vegetables, which he had found all over Armenia, a little higher he found ſeveral which had not occurred to him ſince his departure from France, in his further progreſs, he found conyſa cœrulea aeris, cotoneaſter folio rotundo, hieracium fruticoſum anguſtifolium majus, jacobea ſenecionis folio rag euphraſia vulgaris, and others which are common in Sweden, but on the ſummit, he found the very ſame plants which are produced on the mountains of Switzerland, and Lapland " The plants which are deſcribed by Cæſalpin, Tournefort, Columna, and Pontedera, as growing on the leſſer hills of Italy, abound in every meadow with us, all which proceeds from the air, and the altitude of the ſoil

SECT III

Wholſom and palatable Berries

A great variety of wholſom and well-taſted berries are to be found in Norway, firſt, here are, as in Denmark, and other places, cherries of ſeveral kinds, of which, particularly the peaſants in Sognefiord, and Hardanger, fill great quantities dried Hagebar, probably a kind of ſloes, an infuſion of which in wine, like cherries,

cherries, makes pleaſant and cooling liquor Ribs, i e currants, red and white, which are here called vinbar, i. e wine-berries, ſoelbar, ſun-berries, hindbar, raſpberries; likewiſe red and white ſtickkleſbar, Gooſberries; brambar, blackberries, biornebar, barberries; hyben, a kind of berries, which alſo are here called clunger; blaabar, bilburnes, and a large ſort of them called blaakbar, or krakebær, cranberries, and eſpecially the wholſom and delicious jordbær, ſtrawberries; of which there is great plenty, beſides many other kinds of ſuch berries as are hardly to be met with in any other country than Sweden and Norway The firſt of theſe is oexel or aſaldbær, of which a farther account ſhall be given in the article of trees, tegebar or teyebar, by Lockſtor called uvænorweg, growing on long ſtalks which run along the ground, and hanging at the end of them in bunches like grapes, the leaves are like thoſe of the cherry-tree, the bloſſom white, ſmall and conical, the berries in appearance like currants, but far ſurpaſſing them in taſte *.

Tranebær, myrtillus repens, likewiſe grow on long ſmall ſtems, ſpreading themſelves along the ground, the berries are red and ſour, and, like the ſloe, do not ripen till winter, or rather the ſpring, when on removing the ſnow, I have gathered them on the mountain Filefield in their perfection, yet did not find in them that high flavor which the rein-deer ſeem to enjoy in eating them, and perhaps it is for their refreſhment that the God of nature may have particularly intended them

Crakebær grows upon a ſpinous ſtem of a middling height, not unlike the juniper-berries, the fruit has ſome affinity with the

* In Chineſe Tartary grows a root called ginſeng, which from the deſcription and figure of it in father du Halde, Deſcript de la Chine, T II p 182 ſeems perfectly to correſpond with the Norway teyobær, though it is not the berries but the root, which the Chineſe eſteem ſo rare and valuable, that it is ſold by weight againſt ſilver, it is univerſally uſed by the phyſicians of that country, as a medicine for the great men who alone are able to pay for it, and one of the emperors ſent a body of ten thouſand Tartars into the woods only to gather ginſeng L'Empereur avoit donné ordre a dix mille Tartares, d'aller ramaſſer tout ce qu'ils pourroient du ginſeng, à condition que chacun d'eux en donneroit à ſa majeſté deux onces du meilleur, et que le reſte ſeroit payé au poids d'argent fin

The virtues of this root are in the higheſt degree of eſteem, a decoction of it being a moſt powerful reſtorative, invigorating the faculties, diſſipating humours, imparting a regular motion to the blood, ſtrengthening the lungs, preventing nauſeas, ſtrengthening the œſaphagus, recovering the appetite, diſſipating fumes and preventing vertigo's Now whether ſo many valuable properties can center in the tegebar, I leave to the inveſtigations and experiments of the faculty

bilberries,

bilberries, but the juice thereof is white and ſweetiſh: The Finlanders in Nordland are very fond of theſe berries, and uſe them as a powerful antiſcorbutic

Aaker or agerbær, land-berries, derive their name from growing under the graſs in the ridges betwixt the furrows, but they are only found in the northern provinces, being of ſuch a nature, like the tranebæ, as to require a ſharp cold to ripen them inſtead of heat In colour and figure they are not unlike bilberries, only ſomething blacker and larger, the taſte of them is a pleaſant acid In Sweden, particularly the province of Middelpad, abounds in them, and great quantities are carried to Stockholm, where they are chiefly uſed to put in wine, like cherries, for a pleaſant and cooling ſummer-draught Linnæus, in the above cited paſſage, recommends, that in tranſplanting them, during winter they ſhould be covered with ſnow to cheriſh them, as without this fence they infallibly periſh.

Plate X fig c

Tyltebær a very wholſom and pleaſant red berry, growing on the moſs in high ſituations The ſtem is ſhort, the leaves ſmall like thoſe of box, the flowers of a lively red Theſe berries grow ſo thick that they are plucked off by handfuls, they are in ſuch vogue in Denmark, as to be ſent thither preſerved for the table, and though their ſweetneſs and acidity be mixed with a bitter, yet this is very pleaſant, and greatly promotive of digeſtion, which has recommended it to be uſed at tables Their juice is thick, but when mixed with wine is exceeding palatable and wholſom.

Meelbær

Among the tyltcberries grows another tribe called meelbær, all the difference betwixt theſe is, that the ſtem of the meelbær is a little thicker, and the berries a little flatter, but of no manner of value, and full of little white grains like ſand

Chamæmorus Norvegica Plate X fig c

Moltebar, Chamæmorus Norvegica, the Norway-ſtrawberry, grows in ſwampy or moſſy places, on ſtems ſomething larger than the common ſtrawberry, the flower whitiſh, with a round indented leaf, about the circumference of a half-crown, if it happens to thunder whilſt they are in bloom, the produce of the berries is greatly diminiſhed thereby, otherwiſe, ſuch is the abundance of them, that they are carried as a pickle by barrels, and even tuns, to Germany, and Denmark, where, according to Thom Bartholin, in Med Danor domeſt by order of Chriſtian IV. great pains were taken to propagate this fruit in his gardens,


N° 2
a
Tegeber
p 233
Tilliebaer


b
p. 134
Malabar
c

but hitherto to no purpoſe, though I have been informed that in Jutland, in the province of Vendſyſſel, they grow ſpontaneouſly, but neither ſo good nor in ſuch plenty as in Norway, in ſhape they ſomething reſemble the mulberry, though not quite ſo long, of a flame-colour, their original taſte is much ſweeter, than after exportation, or when kept throughout the winter, tho' the acidity ſtill retains its agreeableneſs, and is withal ſo ſalubrious, that our phyſicians are unanimous in commending it as an incomparable antiſcorbutic. Thus are theſe, and other berries, together with the before-mentioned ſcurvy-graſs, angelica, trefoil, &c an ample proviſion, which, according to the paternal views of the Creator, nature has pointed out to the Norvegians for relief in their ſcorbutic diſorders Thom Bartholin ſays, " Confectio et ſpiritus mororum Norvegicarum omnium vota ſuperat Mori hujus ea in profligando ſcorbuto deprædicatur virtus, ut eo affectu laborantes, Norvegi amandentur ad virgulta, ubi uberrima hujus fructus eſt meſſis, ut illis ſolis baccis veſcantur, teſtaturque experientia, ſanos ad ſuos poſt illum reverſos " I omit the deſcription given of the moltebær by Simon Paulli, in his Flora Danica, page 139 becauſe Lochſtor, in his already-cited diſſertation, charged it with inaccuracy, and promiſed one more correct, but was prevented by his untimely death; unqueſtionably ſomething more authentic concerning the Norvegian plants might have been expected from him, than the little which is hitherto * known, tho' the knowlege of it be very far fetched However, what I have ſet down is ſo far intitled to credit as having experience for its baſis, though I muſt withal obſerve, that in the figure of the moltebær, the flowers are made a little too big in proportion to their leaves, in the other figures of the Norway vegetables, I cannot diſcern any conſiderable overſight, and the greateſt care has been taken for their exact reſemblance to the originals

In Medic Danor Domeſt p 160

De Mel Norv ſuſſi c 2 p 15

Several kinds of plumbs attain to a tolerable ripeneſs, which can very ſeldom be ſaid of peaches and apricocks, it being mere matter of curioſity to plant and eſtimate their trees, as is in moſt places here the caſe with vines.

* In T 1 p 56 No 66 Of Olai Wormii epiſt is a letter to Nic Paſchaſius, biſhop of Bergen, which gives us to underſtand that the famous Otto Sperling in his younger years, travelled over this his native country for making a collection of Norway plants and vegetables, the loſs of which is greatly to be lamented

Apples and pears of ſeveral kinds are found all over the country, and the peaſants now begin to apply themſelves to the cultivation of them both, with more ſkill and more diligence; but the greateſt part of theſe are ſummer-fruit, which ripen early, the winter-fruit ſeldom comes to perfection, unleſs the ſummer proves hotter, and the winter ſets in later than uſual. In this dioceſe, Sognefiord, Nordfiord, and Hardanger, are the beſt parts for the growth of fruit-trees, many of the peaſants there being able to clear their yearly aſſeſſments from their apples and cherries. Of the forreſt-apples, likewiſe, a cyder is made, but not to any great amount.

SECT. IV.

Of the woods of Norway in general.

But tho' in the article of fruit-trees, Norway muſt be acknowledged inferor to moſt countries in Europe, yet this deficiency is moſt liberally compenſated in the bleſſings of our inexhauſtible foreſts, a bleſſing of ſuch importance, that in moſt provinces immenſe ſums are received from foreigners for maſts, beams, planks, boards, and the like, not to mention the home conſumption, for houſes built entirely of wood, beam upon beam, ſhips, bridges, piles, moles, &c. likewiſe for the infinite number of founderies, which require ſuch an immenſe quantity of ſmall-coal in the fuſion of metals, beſides the demands for fuel and other domeſtic uſes, to which muſt be added, that in many places the woods are felled only to clear the ground and be burnt, the aſhes ſerving for manure, and ſometimes by negligence, in the drought of ſummer, the fire ſpreading along the moſs, thouſands of trees are weakened at the roots, and afterwards blown down by the firſt high wind. No. is this all, the peaſants alſo uſe an infinite number of young trees for incloſures and fences for their houſes, gardens, and roads, tho there be no want of ſtone to anſwer that purpoſe. Theſe, and all other circumſtances conſidered, the want of wood in Norway muſt have been at leaſt as great as the preſent abundance of it in moſt provinces, had not nature indued the ſoil, even in the moſt barren mountains, with a moſt ſingular fecundity in the ſpontaneous production of trees, an evidence of which are the many ſhoots from the ſmalleſt fiſſures of the rocks, which thrive much better than when carefully planted in a good

ſoil However, here, as in other things, the difference in different provinces is very great On the weſtern-coaſt, ſome houſe and ſhip-timber are exported to Scotland * and Spain, but this cannot come into account in compariſon with the exports from Drammen, Frederickſhall, Frederickſtadt, Chriſtiania, Skeen, Arendal, Chriſtianſand, Chriſtian's-bay, and Drontheim, where the produce of the woods ſupplies an immenſe trade, the maſts and large beams being floated down the rivers, and the latter divided into boards at the ſaw-mills Sometimes piles of it are ſeen in the ports like little mountains, that one would imagine it muſt require a very long time to remove them, whereas a ſingle embarkation for England, Holland, France, or Spain, in a few days ſweeps them all away, yet in a few weeks theſe places are again covered with mountains of timber The ſaw-works are the beſt manufacture in Norway, an infinite number of families get a comfortable maintenance from them, together with the felling and floating of the timber Before the year 1530, ſaw-mills were not known in Norway, the ſtocks were hewed down, and with the ax ſplit into two planks, whereas now they are ſawed into ſeven or eight, ſo that moſt of the wood was waſted into chips, which is the caſe to this day in ſome places, where ſaw-mills are not yet introduced, particularly at Sundmoer and in the province of Nordland, where great numbers of boats and barks are built of theſe hewn planks, they are indeed much ſtronger, but conſume too many trees, the greateſt part of which is left on the ground to rot The tenth of all ſawed timber belongs to his majeſty, and makes a conſiderable branch of the revenue, Nic Cragius in Vita R Chriſtiani III informs us, that this duty was eſtabliſhed in the year 1645, and further, that even in thoſe times, the large exportations to the Dutch, were at that time apprehended to be detrimental to the national timber "Regi compertum magnam vim materiæ undiquaque ex Norvegia in varias partes Europæ exportari, ita ut ſylvæ ad vaſtitatem multam

* The Schot-laſt, as it is called, annually exported out of the diocеſe of Bergen, unleſs brought under timely reſtrictions, is a manifeſt deſtruction of the foreſts, as it conſiſts entirely of young pine-trees, all ſo ſtraight and pliable, that if left to grow to maſts, they would yield an hundred ſix dollars each, whereas now they are ſold for two marks and a half the dozen, and when larger, about twelve ells in height, the dozen uſually goes at five marks, which, excluſive of the wood, of which ſo much puns is taken to clear the country, does not ſo much as pay for the Labour

redi-

redigerentur. Quod malum ne licentia nimia exitiosum regno tandem foret, edicto statim vetitum, materiam quoquam, nisi in Daniam evehi" Upon this, the Dutch made a heavy complaint to the emperor, who at that time was their sovereign, and he accordingly sent remonstrances to the king, but received for answer, that the necessary preservation of the timber required such restraint, especially as the peasants totally neglected tillage and husbandry, for the more easy way of maintaining themselves by felling of timber, Deserente plebe rustica agrorum cultum, præ facilliore opera materiæ cædendæ, jacere possessiones steriles et infrugiferas

These complaints are heard in many places, for altho' the increase of tillage be at present double to what it was at that time, yet on the other hand, from the increase of the inhabitants, and division of estates among several sons, the northern peasants still chiefly give themselves to timber-labour This could not possibly long subsist, without that remarkable fecundity in the soil for producing trees in those places, where the young trees are permitted to reach their full growth, by the prudence of the proprietor, or by the situation of the wood, rendering the exportation of it difficult; for it is my opinion, that more wood rots in Norway, than is burnt in a whole year in Denmark Indeed the vast and thick forests seem to contradict any apprehensions that ever the country can be in any want of common timber, but as to the fir-trees, and oaks, it is to be feared that posterity will be at some loss for them, unless the forest-laws are more strictly executed, particularly with respect to young trees, of which the continual exportation must be attended with very bad consequences The best wood for timber (for of other wood there is plenty every where) is in the following provinces, Sultan, Helleland, Romsdale, Guldbrandsdale, Osterdale, Soloe, Valders, Hallingdal, Sognfiord, Tellemark, the lordship of Nedene, Buskerud, and in the counties

SECT V

A catalogue of the Norway trees.

As to the several species of trees, of which the woods in Norway consist, the principal are the fir and the pine-tree However I shall endeavour to enumerate them all, according to the

beſt of my knowledge, in the ſame method, in which I have already delivered a catalogue of our vegetables.

Alm or Elme, Ulmus, the elm-tree, is not very common here, but grows to a pretty conſiderable height The bark is dried, grinned, and mixed by the poor among their meal, it is likewiſe boiled and waſhed in meal *.

Aſald, ſee Oxel.

Aſk or Eſk, the aſh grows almoſt univerſally here. Among divers other uſes of this tree, the peaſants diſtil a balſam from it, called Aſke-Smittel, or Aſke-Smalt, which every man knows how to prepare, and ſerves for a domeſtic medicine both in internal and external caſes Dr Lochſtor, in his Diſſertat de Mædic Norv ſuff p 16 beſtows the following encomium upon it; Euporiſton pro utroque ſcopo Norvegis eſt oleum empyreumaticum, vel potius balſamum, vulgo Aſke-Smalt dictum, è fraxino paratum, quod tam interne datum, quam externe adhibitum mirabili ſe ubique commendat effectu

Barlind very much reſembles, both in kind and appearance, the foreign yew-tree †, but ſeldom grows ſo large, and is rather of uſe in hedges, than for ſingle pillars or poſts The trunk, which is of very moderate bulk, is ſtrong, and was formerly made uſe of for ſhooting-bows The veins of this tree are ſo fine and reddiſh, that the makers of violins in Hardanger, uſe it for that and other muſical inſtruments, and the joiners apply it to the purpoſes of fineering and inlaying The young ſhoots are ſometimes carried to Denmark, to be planted in the gardens of perſons of diſtinction. There are beautiful hedges of it near Frederiſberg

Beenved is a tree not very common, of the ſame kind with the Privet. It is made uſe of for fine work, being hard and ſolid, which very well ſuits the cutting inſtrument uſed by the joiners and turners in Norway It grows on the higheſt mountains The peaſants make a decoction of this wood, which is eſteemed good for a conſumption

* This powder of the bark of elms is boiled up with other food to fatten hogs, who thrive ſo much upon it, that the virtues of the bark of elms are even proverbial here

† This tree is divided into two kinds, the ſummer-yew, whoſe leaves are ſomewhat lighter, and the winter yew, which is of a darker green Our Norway Barlind is of the latter kind

Birk, birch, grows in moſt parts, and in the greateſt plenty. It is of two kinds, the common birch, and a leſſer ſort with ſmall thick leaves. Birch is made uſe of here for various purpoſes *. It is more generally uſed for fuel than any other wood, and is carried to the great towns for that uſe, and ſometimes exported abroad from thence. But the bark is of greater utility, and that in two reſpects. The extreme white bark, which is diſtinguiſhed by the particular name of Never, or rind, and ſometimes grows again upon the ſame tree from which it hath been pealed off, provided this was done carefully, is ſo fat and firm in its parts, that it will eſcape putrefaction for many years, even in the dampeſt places. It is on account of this quality, that every peaſant ſpreads it over the fir planks with which his houſe is covered, and upon this Never he lays green ſword or turf to a conſiderable thickneſs for the ſake of warmth. The inner, or the dark brown bark, is applied, like the bark of oaks, to tanning of ſkins and hides, and even fiſhing-nets and ſails, which it renders more durable. The Scotch likewiſe uſe it for tanning their hides, and pay eight Daniſh-ſhillings for thirty-ſix pound weight of it. Beſides all this, thoſe who like it, draw a wholſom and pleaſant juice from the trunk of this tree, as in the eaſtern countries the ſame is practiſed with palm-trees. They bore a hole in the trunk †, and the juice diſtills into a flaſk hanging under it, without the leaſt damage to the tree, provided the hole is immediately ſtopt by driving in a wooden peg.

Boeg, beech, is rather ſcarce here, except in the counties of Laurvig and Julſberg. And it does not appear, that beech grows ſpontaneouſly at a certain diſtance northward, for according to the obſervation of Linnæus, in the tranſactions of the Swediſh academy for the year 1739, vol. 1. p. 22. it doth not grow in

* Valbirk, the maple-tree, which ſprings from the root of ſome birch trees, is uſed in [illegible] and poliſhed works, being hard, firm, veiny and ſpotted, and was thought beautiful, when heretofore the drinking mugs were made of it.

† Dr. Buchwald, in his Specimen Botanicum, p. 51. ſays of this birch juice, "in ſcorbuto, ictero, podagra, nephritide, calculo, et cunctis [illegible] chronicis morbis tartareis, tam [illegible] ſingulare eſt remedium." A certain friend told me from his own experience, that from the buds of birch, gathered juſt when they are full of their [illegible] viſcous ſap, and diſtilled with birch water, or for want of this in other good water, may be drawn a milky juice, which when it ſubſides and clarifies, leaves at the bottom and on the ſides of the glaſs, a pretty thick balſam, which being duly ſeparated, is in point of conſiſtence, colour, ſmell and taſte, exactly like the precious, tho' frequently counterfeited balſam of Mecca.

Sweden

Sweden beyond Eaſt and Weſt Gothland, conſequently not very far north.

Eeg, oak, the ſtrongeſt and moſt durable of all trees, was heretofore in great abundance in this dioceſe of Bergen, as well as elſewhere, but is of late become ſcarce The beſt oak-foreſts are in the dioceſe of Chriſtianſand, particularly in the lordſhip of Nedene, from whence great quantities are every year carried to Arendal and Chriſtiandſand, for ſhip-building, and many ſhips are loaded with it every year for Holland, tho' the exportation be prohibited. Norway-oak excels that of all other countries, except the Daniſh, which is preferred to it A decoction of oak-leaves in beer is uſed by the peaſants in Norway, as a cure for the gout or rheumatiſm, by dipping a cloth in the decoction, and applying it warm to the part affected

Elle, which is likewiſe called older and oor, the alder-tree, is of two kinds, viz the roedoor, or red alder, this is the moſt common, and the leaves of it are ſomewhat rough, and Svartoor, black alder, whoſe leaves are ſmooth and ſhining, the latter grows chiefly in marſhes and other ſwampy grounds The twigs of it are judged wholſom food for the ſheep in ſpring, as it expels the water, which is apt to lie in their bodies, and to cauſe a kind of dropſy The bark is uſed for a black dye If it happens to ſnow after this tree has put out its leaves, then the leaves turn brown, dry and wither, together with the trunk, which is occaſioned by a ſpecies of ſmall worms, which are ſaid to be in the ſnow, and affect no other tree But if it be cut down immediately, the root will ſhoot again

Enebær-tree, (which is here commonly called ſprake, and in other parts of the country, briſk and bruſe) the juniper-tree, grows in abundance almoſt every where, and by the ſpreading of its branches over the ground, ſerves to cover and cheriſh the young ſhoots of firs and other trees, but at the ſame time kills the graſs The body of this tree, which ſeldom exceeds ſix or ſeven ells in length *, is uſed for poles and hedge-ſtakes, as alſo for paling, it

* In the church of Trovær, in the province of Nordland, and diſtrict of Senjen, there are, according to common report, two pillars of juniper-tree eighteen ells high from the ground, which, if true, and if the pillars are not compoſed of ſeveral pieces, is very extraordinary It is more notorious, that the trunks of a juniper tree is ſometimes thick enough to be ſawed into ſmall boards, which are uſed for cheſts and cupboards, and always give an agreeable ſmell in a room

being on account of its fatneſs more durable than any other wood. In Nordfiord and elſewhere, a very valuable juniper-oil is extracted from the fruit, and ſometimes exported to Holland. The ſame uſe is made of the berries, but not ſo frequently now as heretofore.

Eſp or bever-eſp, the aſpen-tree, whoſe leaves ſhake and tremble at the leaſt motion. The twigs are, like thoſe of the birch and alder-tree, given to the cattle, particularly horſes, when other fodder is ſcarce. This tree, which in other reſpects is very weak and tender, proves to be almoſt incorruptible, in the water or humid ground, when it is laid down without being ſtripped of its bark, and is thereſore much uſed for water-pipes and gutters under ground.

Fyr, or as it is here called fure, the fir-tree, is of two ſorts, the red and hard fir, which grows upon the mountains, and contains the greateſt quantities of reſin, and the whitiſh ſort, which grows quicker in low and moiſt grounds, but is of much leſs value, conſiſting only of the bare timber. The fir-tree in general, which grows almoſt every where in Norway, is the richeſt produce of the country, for this ſingle tree yields annually at leaſt, I ſpeak within compaſs and from the ſtrongeſt aſſurance, above a million of rixdollars, eſpecially if we include the advantages of the ſaw-mills, and the maſts, ſome of which are ſold from one hundred to two hundred rixdollars each.* Theſe trees, excepting thoſe on the mountains, from whence they cannot be ſo eaſily removed, are now ſeldom ſuffered to grow ſo large as in former days, of which we have the ſtrongeſt evidence in modern houſes, for a peaſant's apartment, which heretofore uſed to be raiſed by four ſticks of fir-trees laid upon each other, requires now commonly ſeven or eight. The richneſs of the ſap of the red fir-tree may be concluded, among other arguments, from the age of ſome of our Norway-peaſants houſes, which are ſuppoſed to be three or four hundred years ſtanding, if not more. We even read in Mr. Jon Ramus's hiſtory of Norway, that in the farm of Næs in

* A whole tall tree, which when ſtanding may be eſtimated at ſixty, hundred, or hundred and twenty rixdollars, cannot, after it is cut down, be conveyed to the ſea-ports for leſs than double the price of it; for beſides the many other trees it requires to form a kind of bed for it to float upon, leſt it ſhould be torn to pieces by the rocks, ſometimes an hundred trees or upwards muſt be fell'd to make a way for it, and labourers are employed to hew the places impaſſible for horſes.

Guld-

Guldbranſdale, the houſe is ſtill ſubſiſting, in which king Oluf lodged five nights in the year 1022, above ſeven hundred years ago, when he took a circuit round the kingdom to convert the people to the chriſtian religion From the roots of the fir-trees the peaſants burn tar, even an hundred years after the trunk has been cut down This tar is a very profitable commodity, and ſo excellent in its kind, that biſhop Berkley, in his treatiſe on the virtues of tar-water, recommends the Norway-tar in preference to any other An eminent merchant in this place has aſſured me, that the diſpenſaries in London apply to him yearly by letters for forty caſks of tar, the produce of Nordfiord, which is of a more reddiſh colour than any other In like manner the fir-trees from Norway and Sweden are in much higher eſteem, than trees of the ſame name and appearance in the warmer countries, in Spain, for inſtance, about Tortoſe, in Tuſcany, in Dalmatia, and other countries on the Mediterranean, which may indeed content themſelves with their own for want of better, but could not ſell them in their own ports, if a Norway-man ſhould import a cargo of ours There have been attempts made to ſow the Norway fir in England and other parts, but the difference of ſoil and climate will not ſuffer the trees to equal thoſe of Norway In reſpect to the ſoil, it is not the good, rich and black earth, that favours this tree, nor the clay-ſoil, but rather the gravelly, ſandy, or mooriſh lands The method of ſowing other trees will not ſucceed with this It chuſes to grow independent, and to ſow itſelf at pleaſure The beſt method therefore is to hang up here and there, on a pole erected for the purpoſe, ſome of the ripeſt pine apples, by which the ſmall ſubtil ſeed which lies concealed between the knots, may be thrown out by the motion of the wind, and drop wherever that carries it In the fens, the marrow or reſin of the fir-tree is naturally transformed into an incenſe, which may be called the Norway-frankincenſe, and is found in the ſenny grounds The buds or pine-apples of the fir-tree, boiled in ſtale beer, make an excellent medicine for the ſcurvy, and not ſo unpleaſant to the palate, as the tar-water, tho' in effect of the ſame kind In Sundmoer, and perhaps in other parts, ſome branches grow upon a certain ſpecies of fir-trees, which appear quite monſtrous and ſtrange in compariſon with the reſt, for they are not

round, but entirely flat, and ſhaped in ſuch manner, as almoſt to reſemble the horns of a Deer

Gran, the pine-tree, is, together with the fir, the moſt univerſal wood of this country's growth It is more beautiful than the fir, in figure, height and colour, but far inferior to it in ſap and ſtrength, which occaſions the boards or planks of it to be ſold at a lower rate The Norway peaſants have ſo little mercy upon their pine foreſts, that they ſeem to think it their duty to deſtroy them, inſiſting upon it, that they cannot poſſibly be exturpated in the vaſt tracts of land, which continually produce a freſh ſupply In the ſpring, when forage is ſcarce, the peaſant is permitted to cut thouſands of young pines, but in autumn he is not allowed to give his cattle more than the ſmall ſhoots

Hage-torn, the cornel-tree, and ſloe torn, the ſloe or bullace-tree, grows indeed in theſe parts, but is not planted in the green hedges, as in other parts, for the Norway peaſant is not dextrous at planting, and thinks it a merit, if he does not deſtroy the free p oduce of nature

Haſſel, haſle-trees, are here pretty large, and in ſuch abundance, that it is no uncommon thing for a hundred tun of nuts to be exported from Bergen alone On the other hand, the walnuts here are not of a ſpontaneous growth, but muſt be ſet, when they thrive very well, eſpecially in the barony of Roſendal

Hyld, elder, with its ſalubrious berries, is alſo of Norway growth, but is neither here nor in Denmark, eſteemed or made uſe of according to its worth Sambucus aquatica, in Daniſh called Vand-hyld, water-elder, the flowers whereof look like ſnow-balls, and upon that account in German are called ſnowball ſhrubs, is likewiſe to be met with though not every where

Ivenholt, or ebenus, ebony, is by J L Wolfe, claſſed among the trees which grow in Nordland, under the mountain of Kolen, but being without any additional confirmation of this, I cannot deliver it as a certainty, I muſt obſerve, however, that the following words of Wormius, may have given riſe to this opinion, though he delivers himſelf with ſome doubt, "Ab hoc ebeno foſſili diverſum eſt, quod in Iſlandia reperitur, et laminatim cruitur, colore nigerrimo, quandoque ſubluſco, ponderoſum et fragile, exſiccatum ubi fuerit, quanquam mercator, qui ejus mihi copiam fecit, lentum

lentum adeo et flexile eſſe, cum primum è terra eruitur, retulerit, ut viminis inſtar, in quamvis partem trahi poſſit ac flecti Fibris conſtat obliquis ex nodis hinc inde, plane inſtar radicis majoris cujuſdam arboris In iis locis iſlandiæ, ubi magna copia eruitur, terra ad duas ulnas effoſſa, nullæ plane ſunt arbores, aut fuiſſe unquam, animadverti poteſt Quo circa neſcio, an eorum probari poſſit opinio, qui exiſtimant, hic olim ſylvas fuiſſe, quæ relictis radicibus, incendio conflagraverint Radicum vero truncos à ſucco ſubterraneo vitriolato colorem nigrum contraxiſſe veroſimilius Muſ Worm p 169

Lind, lime-trees, great quantities of theſe are found in certain places, both with large, clear, and ſmall dark leaves The peaſants with the bark make very elegant butter-baſkets, or other veſſels for the carriage of the butter, likewiſe lines for huſbandry, and alſo for fiſhing

Lon, acer major, the maple alſo grows here, but little uſe is made of it

Piil, willows of ſeveral kinds are to be found in many places, but made no account of, except by the goats, who feed with pleaſure on its juicey and bitter bark, though of one kind called ſalina, the bark is uſed for tanning ſkins, the broad-leaved kind, the leaves whereof underneath are woolly, goes here by a very long and ſtrange nick-name, Tract ſomſanden ſlaaede geden under, i e the tree under which the devil ſlead the goats What traditional fable gave occaſion to this, I know not, but probably it aroſe from hence, that as the goats delight in ſtripping theſe trees, as has been ſaid, ſome one has conceited, that the devil by way of retaliation, under this tree ſtrips or fleas the goats, in their turn But whilſt I am writing this, I have received from an ingenious hand a more probible conjecture on the cauſes of this name, that ſeveral ſmall threads, or filaments like goats-hair, lie betwixt the wood and the bark He further informs me, that a decoction of theſe fibrillæ is of a ſingular virtue in curing the ſcurvy Whether this tree is to be found in other countries I cannot ſay *

Roſentiae, the roſe-buſh, bears here, as well as in other places, red, white and yellow roſes, both double and ſingle

* Some attribute the properties of this tree to the ſambucus aquatica before-mentioned, but how juſtly, I cannot determine, for want of perſonal experience

Rome,

Ronne, the wild Sorbus-ſylveſtris, the wild Service-tree, grows every where, even on the parched ſides of the mountains, nouriſhing with its berries, not only the field-fares or cock-thruſhes, of which we have many, and in great perfection, but even the bear, though the latter, generally, to the ruin of the tree, the weight of his body breaking and damaging the tree in his climbing up The young twigs are gathered with the berries on, and uſed medically, in winter, againſt the belly-ach

Tindveed, the name of the tree called the Spina-Chriſti, or Chriſt-thorn, is pretty common, and being an ever-green, is frequently planted near houſes

Oexel, or Axel ſorbus terminalis, a kind of ſervice This tree is one of the particular natives of Norway, and little known to foreigners Mr Chriſtian Gartner, who viſited ſeveral countries, and had thorough knowledge in his profeſſion, ſays, page 47, of his Horti Cultura, that he firſt met with it in counſellor Shultz's garden in Drontheim, on which account I have annexed a draught
See plate IX of one of its branches with the leaves and flowers, Linnæus makes the following mention of it, Oexel, cratægus, foliis ovalibus inæqualiter ſerratis, Hort Cliff 187 Cratægus ſcandica, foTranſactions of the Swediſh Academy of Science for the year 1751 Book II p 93 lis oblongis, non nihil lacinatis et ſerratis Celſ Upſ 17 It grows in Oeland and Guland (Gothland) but except in Sweden and Norway, it is hardly to be met with growing ſpontaneouſly* Some places in the neighbourhood of Bergen produce this tree, but not in great numbers The ſtock and branches bear ſome reſemblance to the ſervice-tree, but bend more, the bark is of a greyiſh brown, and veined, the leaves of a finger's length, half as broad, and indented, the points towards the extremity being ſmall, but the indenture within the leaf is ſo deep as to make the appearance of other diſtinct leaves on the ſame ſtem At the extremity of every branch, and betwixt three leaves, hangs a bunch of thirty or forty berries, oblong, red, and, when ripe, diſtinguiſhed with a black ſpeck, their ſtones ſmall, the juice red, and when infuſed in wine very pleaſant Valerius Cordus, in his Diſpenſary,

* In ſome few parts of Germany eſpecially in the diſtrict of Tournigen, grows a kind of tree, which is there called Arlsbeer-tree, and which by its deſcription, has a great affinity with our Oexel See Allgem Oeconom Lexicon p 124

commends theſe berries, as a cooling, and at the ſame time an aſtringent, medicine †.

SECT. VI.

Among the vegetables of this country, we muſt further claſs what by many is looked upon only as a conflux of effœte ordure, but is in reality, and eſpecially when examined thro' a microſcope, a regular vegetable, furniſhed with root, ſeeds, and leaves; I mean the ſeveral kinds of moſs, with which this country is over-run, not only on the meadow-ground, where it is very detrimental, but alſo on the trees, from which, after a ſhower it is eaſily detached, tho' at other times adhering very cloſely. This moſs, upon a narrow inſpection, is very different in colour, white, grey, brown, yellow, black, and ſpeckled, in figure, being either entangled like wool, or with long filaments, or again with leaves regularly diſpoſed, tho' of different figures, and it is ſometimes full of ſmall round capſula, as recepticles of the ſeed *. This mean and deſpiſed vegetable, which ſeems to die under a long continuance of heat and drought, immediately recovers new life from the rain, and is not made in vain by the wiſe Creator, it being the ſupport and fodder of many thouſands of rein-deers, on the barren ſummits of the mountains, thro' all the ſeverity of the winter; they remove the ſnow with their feet to get at this delicious food, and they can neither thrive nor live to any time, if, as has been often tried, they are removed into another country

Moſs on trees and ſtones.

† Thus has the Sovereign of nature liberally dealt out particular vegetables and trees to every country, according to the climate and ſoil thereof, and the neceſſities of its inhabitants.

> Nec vero terræ ferre omnes omnia poſſunt.
> Fluminibus ſalices, craſſiſque paludibus alni
> Naſcuntur: Steriles ſaxoſis montibus orni,
> Littora myrtetis lætiſſima. Denique apertos
> Bacchus amat colles, Aquilonem et frigora taxi.
> Aſpice et extremis domitum cultoribus orbem,
> Eoaſque Arabum pictóſque gelonos.
> Diviſæ arboribus patriæ. VIRGIL. Georg. Lib. II. Ver. 109.

* J. Chr. Buxbaum in Commentar. Acad. Petropol. Tom. III. p. 171. Treats of ſeveral kinds of moſs, and particularly gives the following account of a Norway-moſs. "Genuina muſci ſpecies eſt muſcus Norwegicus, umbraculo rubicundo inſignitus, muſci Petrop. quem Tournefortius incongrue Lichenoidibus accenſuit et Lichenem capillaceo folio, elatiorem pelvi rubentium vocat, deceptus forte a ſcuto, quod hic in ſummo fert pediculo, quum ſciret multos ex Lichenibus eſſe ſcutigeros. Sed hoc ſcutum in hoc immuſco nihil præter calyptram, ſummo tempore capitulo pyriformi paluſtri, et eſt calyptra quaſi expanſa."

where they may have their fill of the beſt graſs Without plenty of moſs, and ſeeking for it in their natural freedom, they ſenſibly linger away Beſides this, our peaſants make a decoction from many kinds of moſs, which is diſpoſed of to the dyers, this is here called Borke, and makes a good red and brown dye for vadmel, the coarſeſt ſort of cloth uſually worne by the peaſants There is moreover a certain kind of yellow moſs hanging on the branches of firs and pines, which is very venomous, yet applied to a neceſſary uſe, for being mixed in pottage, or with fleſh, as a bait for the wolves, they infallibly die of it

Of fungous vegetables, which are called by the general name of Skuroc-harre, or Champignons, i. e muſhrooms, ſeveral ſorts are to be found here, as in Denmark and other places, particularly thoſe which are dried and ſold by the name of Markler (the ſame which in England are called muſhrooms) Theſe grow in the neighbourhood of Buſkerud in Hedemark and other places, and are bought up by the curious to ſend abroad ‡

CHAP VI

Of the Sea-Vegetables of Norway

SECT I *Sea-vegetables little known to us* SECT II *Several ſpecies of ſea-graſs* SECT III *Various kinds of ſea-trees* SECT IV *Great and ſmall corals*

SECT I

Sea vegetables little known to us

HITHERTO, I have, to the extent of my knowledge, given an account of the land vegetables of Norway As to thoſe of the ſea, it would give me pleaſure if I could gratify the reader's curioſity with ſome new diſcoveries in this latent part of the kingdom of nature However, the little I have to offer is grounded on my own experience in voyages, and the reports of intelligent ſea-faring perſons But leſt this ſhould be thought a ſubject of no utility, I ſhall introduce it with the following paſſage from

‡ This kind of fungus is uſually found under birch trees They are of a reddiſh colour, with little white ſpecks penetrating through them, ſome call them Lutſvamp, i. e fly ſponge they being boiled in milk and ſet out to deſtroy flies, this fungus being a ſtrong poiſon

that ingenious naturaliſt M Anderſon of Hamburg "It is to be lamented that the botaniſts, eſpecially the Germans, for want of opportunity, being remote from the ſea, have not, nor can apply themſelves with a preciſion becoming the ſubject, to make a collection of the marine-vegetables about this country, diſtributing them in proper claſſes, with deſcriptions of each For ſince I have entered upon theſe ſpeculations, and collected as many kinds as I could, they appear to me, matter of freſh wonder and moſt exquiſite delight to a devout naturaliſt, in the conſideration of their inexpreſſible, and to a ſtranger incredible, variety, figure, colour, production, without roots, &c and when I reflect, that nothing but what is good and uſeful comes from the hand of the wiſe Creator. I will affirm that theſe vegetables, however uſeleſs they may be accounted, not only afford nouriſhment to innumerable living creatures, but might for the moſt part be ſerviceable to mankind, not only as food, eſpecially in time of neceſſity, but likewiſe for powerful medicaments, did not our infatuation for what is foreign and coſtly incline us to under-value them Mr Martin, in his deſcription of the Weſtern Iſlands of Scotland, a book well worth reading, has, in page 148, &c thrown together ſome very valuable obſervations upon them, which he made among the inhabitants of thoſe iſlands, who live in the utmoſt ſimplicity, and in a rational enjoyment of the little, which the author of nature has beſtowed on them, inſtances which ſhould raiſe a bluſh in the effeminate and luxurious" Thus far Mr Anderſon As part of the inhabitants of the ſea bear in their figures a reſemblance to thoſe of the land, as is ſeen in the ſea-cow, the ſea-horſe, the ſea-dog, and ſea-hog, &c ſo fiſhermen, and divers who have opportunity of knowing theſe things inform us, that the eminences and declivities in the ſea, like the mountains and vallies, are over-grown not only with ſea-graſs and plants of ſeveral kinds, but that likewiſe they produce buſhes, trees, and coral-ſhrubs In the chapter on the waters, I have already quoted the teſtimony of Kircher, grounded on the information of Arabian fiſhermen The bottom of our northern-ſea, likewiſe affords variety of ſuch marine plants, ſome of which muſt be unknown to the curious in other parts, and for their ſatisfaction I have cauſed exact figures of the moſt remarkable ones to be inſerted

Account of Iceland, Greenland, and Davis's Straights

Chap. VI. §. I.

But,

But as it is not my concern to aſſign proper appellations to theſe marine vegetables, ſo to diſtribute them into their reſpective claſſes and genera, with that accuracy I could wiſh, is, I confeſs above my capacity I ſhall only, agreeably to their figures, make two general diviſions of them into herbs and trees, the third claſs being the corals or ſtoney vegetables, which by ſome are confounded with the ſea-trees * Mr J C Buxbaum, in Commentar Acad Petropol among other obſervations on marine plants, ſpeaks as follows, " Plantæ ſubmarinæ paucæ fuerunt antiquioribus notæ botanicis, quarum numerum valde auxerunt Rajus Plukenetius aliique, qui his obſervationes ſuas communicarunt Diſtinxit in aliquot has claſſes modo laudatus Rajus, ſed ſi accuratius inſpicias, ipſum invenies confuſum, nullos veros terminos conſtituentem inter fucos et algas et muſcos marinos, quæ illi promiſcue nunc ſub hoc, nunc ſub illo nomine proponuntur, meliorem plantarum ſubmarinarum in genera certa diviſionem debemus Tournefortio, qui tamen in eo reprehendendus, quod ſub fucorum et corallinarum nomine, plantas inter ſe parum convenientes comprehendat

SECT II

Several kinds of ſea graſs

Since my arrival in this country I have made a collection of vegetables growing in the ſea of Norway, and by it I perceive, that what is commonly called tong, ſea-weed, or in Norway, tarre-alga, which is partly found growing on its root †, partly detached by the wind, and by the agitation of the waves is drove aſhore, or among the apertures and corners of the rocks, is ſometimes green, ſometimes of a dark brown, ſometimes narrow and flat, like a blade of graſs, and two or three ells in length, ſometimes ſlender and round, but much longer, I myſelf having pulled up a piece of no leſs than ten ells, conſequently, they exceed many trees in height, and even this might poſſibly be one of the ſhort-

* In ſome parts of the red ſea, the coral trees gradually increaſe to ſuch a degree, that the veſſels and boats are put to no ſmall difficulty to clear their way through them

† So by way of analogy, I call thoſe ſhort ſtems by which all thoſe vegetables are connected to ſome ſtone or other, which generally is grown out along with the vegetable, for properly the ſea vegetables have no roots, being on all ſides ſurrounded with their alimentary matter, and thus ſtanding in need of a root to imbibe their nutriment, ſo that the entire plant muſt be ſaid to be a root

eſt,

eſt, ſometimes they are found with a ſhort, roundiſh ſtem, and leaves about two or three fingers broad, with ſmall ſemicircular indentures like the oak leaf, ſometimes they are longer, and at the end reſemble peacocks feathers, ſometimes plain, ſometimes ſcabrous, with hollow tubercles, but, as far as I could find, without any ſeeds in them. A ſea-weed is ſometimes found here, with leaves of ſuch a length and breadth, and withal even and ſmooth, that I do not know of any of our land vegetables to be compared to them, I have taken out leaves four ells and a half long and one in breadth, and ſo perfectly even and ſmooth, that at firſt ſight a ſtranger would have taken them for green ſattin, and among theſe weeds, the lobſter finds both food and ſhelter. Whether this tarre bloſſoms like other vegetables, I cannot affirm from my own knowlege, but a perſon of curioſity has aſſured me, that he has ſeen the flowers ſwimming on the ſurface of the water, and that they reſemble white lilies, and promiſed at the ſame time to procure me ſome. I here mean only the genera, not doubting, but upon further ſearch, ſeveral particular ſpecies of them may be found on the coaſt of Norway, and other coaſts, eſpecially in Iceland, where the poverty of the inhabitants has taught them to turn the ſea-weeds to various uſes, every kind according to its nature, even to the grinding it to a kind of meal for gruel or pottage, which at the ſame time proves a gentle cathartic *. The peaſants on the ſea-coaſt in theſe parts, who underſtand their buſineſs, make uſe of ſea-weeds for manure in the improvement of their ground, and in the province of Nordland, where in ſummer-time the cattle find plenty of paſture on the mountains and among the meadows, but where on that account they are the more pinched in their winter fodder, it is a common practice to ſupply this ſcarcity with dried tang, and likewiſe with the heads of cods and other large fiſh bones, they alſo make what they call a cow-ſoup, of which the beſt ingredient is tang or ſea-

Its uſe and benefit.

* Concerning the ſpecies of the alga ſaccharifera as it is called, which when dried, looks and taſtes as if ſugar had been ſtrewn over it, and among the Icelanders, in many caſes is uſed for ſugar. See Thom. Bartholini Acta medica, Hafn. Vol. III p. 17. Vol. IV. p. 33. Multa ſaxis marinis adhaeret algae copia, quam vere colligunt, atque tempore interjecto album acquirit colorem, cujus eſt etiam in commendatione cibo, cum dulcedine non inferior ſit ſaccharo. Hinc quoque cum butyro comedunt Iſlandi. See alſo p. 179. relat. Borrichii.

weed * In England and Scotland, where this vegetable is generally called clep, the poor people on the coasts turn it to a good account, burning great quantities of it to ashes, for which they are sure to meet with a market at the glass-houses, likewise by reason of the saline particles contained in these weeds, they are boiled for pot ashes, and the sediment is known to be a good manure

SECT III

Sea trees

Besides these smaller marine products, plants or weeds, the ocean here produces various species of large vegetables, which are known by the name of sea trees, and though of such as grow in a bottom, a hundred or two hundred fathom deep, none except young shoots can be drawn up entire, yet the nets, or lines of the fishermen entangling in the tops of such trees, some of the lesser branches are torn away and pulled up to the surface, and these branches are such as may be concluded to come from large trees, I having one seven inches diameter, though indeed it is the only one of that dimension, the others being but two inches and a half or under, like the slendrest shoots of cand-trees. If I were better acquainted with the latter, it would enable me to undertake a comparison betwixt the congenial products of the earth and water, and thus afford higher entertainment to those of my readers, who have a taste for botany But as Burgermaster Anderson, in the passage above cited, corrects the great deficiency herein, I shall add a short description of those in my collection, which were all drawn up from the bottom of the sea along the coast of Norway

Use of them

I must previously observe, concerning the use and benefit of sea-trees, that the peasants hold them indiscrimmately to be very serviceable against a diarrhœa, in which, however, they may be as greatly deceived, as they too often are in their superstitious practice of hanging up a branch of a sea-tree in their houses, as a kind of talisman or preservative against fire, inferring, in their way of

* Some use to accustom their swine to eat the sea-weed, and for them it is likewise boiled, being otherwise too hard of digestion more particulars on the use of it are to be met with in the Swedish transactions, worth the knowlege of the industrious farmer, who lives near the sea, and is for making the most of every thing

Part I

Sea G


N°3

reaſoning, that theſe being natives of another element will repell fire *

I This is the above-mentioned largeſt branch, ſeven inches diameter, but only on one ſide, the other being ſomewhat ſmaller, ſo as to form a flat cube The leſſer twigs of an ell high, which ſtand parallel to each other, and form a pretty intexture, are of the ſame figure The bark or thin rind which may be peeled off is of a carnation colour. The wood is of a clear white and very porous, with orifices large enough to admit a larding-pin without hurting the wood In what manner the branch terminated, is unknown to me, it being broke towards the end, and without this accident, proportionate expanſion muſt have render'd it not only too big for my muſæum, but poſſibly for my houſe

Plate XI And from hence the number according to order

II This piece is two ells in length, and entire, as are all the following The wood is compact as if without bark or rind, the ſpread of the twigs like that of a currant buſh, here and there a little more incurvated, perfectly ſmooth, of a clear yellow, and towards the tips or ends, as ſlender as a briſtle, with ſmall moſſy filaments hanging here and there among the twigs

III This is three ells and a half long, with thin and ſoft twigs, reſembles the artemiſia, only expands itſelf more on the ſides, which is uſual in marine trees In the thickeſt part of this branch the wood is pretty firm, with inviſible pores, but the twigs to their very extremities are ſtudded all over with little boſſes, of the bigneſs of half a pea, and theſe again ſpotted with dark boſſes, the general colour is a darkiſh brown In one of the cavities of this branch, I found a ſmall white capſula, of a chalky ſubſtance, and in it an inſect like a bug, which upon the capſula's being opened, was immediately in motion This branch pretty much reſembles thoſe mentioned by Wormius, in his Muſæum, p 234 under the name of Planta Marinæ facie reſedæ, likewiſe Cluſius Exot L VI C 6 In the branches of this kind of marine wood,

* The natural and proper uſe of theſe ſea trees, and the like marine vegetables, is unqueſtionably for the retreat and nouriſhment of the fiſh, of which, ſome, as on the land are predatory, living by ſlaughter whilſt others of more peaceable diſpoſitions, feed among the trees and vegetables, which are particularly known to be an exquiſite dainty to the fiſh called Broſmer One learned Theodore Haſe, mentions a north ſea whale the ſtomach whereof being opened, was found full of tang or ſea-weed, Bibliotheque Germanique, Tom XV p 157 Thus are none of God's works ſuperfluous or unneceſſary, though often diſregarded or not underſtood

which

which is the moſt common in theſe ſeas, is often found the ſea-ſtar, which ſhall hereafter be deſcribed under the name of Stella Arboreſcens, or, if my fancy may take place, of Caput Meduſæ, and this creature from its delight in this vegetable may be conceived to make it vital food, at leaſt I have met with it in ſeveral branches of this ſpecies

IV This is an ell and half in length, a full inch diameter, extremely porous, the twigs ſcabrous and curled towards their extremities, bearing round nuts of the bigneſs of a ſmall nutmeg This branch is of a ſtraw colour, but I have another of the ſame kind, which, though of nearly the ſame growth and figure, is very different in colour, being of a deep red, which renders it very ſightly

V This piece is two ells and half long, and the only one I could obtain immediately after its being taken out of the water, and conſequently ſaw it full of ſap, freſh in colour, and in all its vigour It was then far more beautiful than ſince it was dried, being then of a lively red, or a fiery yellow The chief limb is as thick as a child's arm, and the twigs as a finger At each extremity is an oblong excreſcence, like a ſmall pear, but this fruit or leaf, I know not which to call it, is of the ſame ſubſtance as the ſtock itſelf, a circumſtance common to all ſea-trees, none of them bearing thin leaves Having laid it in the window to dry, it diſtilled a mucilaginous liquor of the ſame colour, but of a ſtrange unpleaſant ſmell Whilſt this vegetable retained its moiſture, it had ſome reſemblance to human fleſh, with ſome minute interſtices like pores, but upon the ſtems being dried and ſhrivelled, they became larger, ſo that it now both in colour and figure it reſembles ginger

VI This branch is not ſo ſightly, and ſomething leſs than the former, to which both in colour and ſubſtance it is ſimilar, but not in figure, it being, as the plate ſhews, flatter and coarſer

VII This branch again is leſs than the former, but far more ſightly, conſiſting of a buſhy aſſemblage of many ſmall twigs It is not thicker than a quill, ſpungy within and woolly without, as if covered over with the fineſt cloth Its colour is a pale yellow It has a flat root, preſerved better than any of the reſt, by which, this ſpecies is connected with the rock

VIII


N°8
N°10


N° 11
N° 12

VIII This is of the same colour, and but very little larger, as likewise of the same soft woolly substance, but without any twigs, and consists in one flat thin and extended piece, not unlike the ear of a dog, full of pores and subtle branches, like green leaves when viewed against the light

IX This is an orbicular fungous vegetable, of the colour of the former, but not a quarter of an ell long At one extremity is a round pedicle two inches long, and at the other extremity an aperture, running quite through like the pith in elder This vegetable is compressible, but elastic, immediately recovering its roundness, in softness and delicacy, it exceeds any which I have seen, and unquestionably might be made use of by surgeons, if they could have it at pleasure *

X This vegetable is somewhat harder, but smooth and fungous Its colour is a dark brown, it is covered with a thin bark, the inside of which is full of imperceptible, yet very sharp points, of a vitreous nature, so that it may be used in polishing, but not with the naked hand, these points easily penetrating into the skin, and being as difficult to be got out This grows, like the mushroom, *in deep grounds, and sometimes weighs thirty-two pounds.* The fishermen draw it up with their lines or nets

XI A vegetable three half-quarters of an ell in length, in figure not unlike the Liguſtrum, covered all over with multitudes of small angular nodes, so close, and at the same time so slenderly joined, that on the least shaking of the branch some of them fall off These small nodes, which to the naked eye appear like so many grains of buck-wheat, make a very splendid appearance thro' the microscope, as if they were silver and gold laminæ, or shields curiously embossed with figures The branch itself is round, black, and smooth

XII This is a very tender incurvated branch, whose shoots likewise are full of glittering points and angles, but its extremity perfectly resembles the Conchæ anatiferæ, of which I shall speak in another place, the only difference being that the muscle-shell is invested with a thin brownish tegument, and but of half the

* Concerning these springy marine substances, some relate that they have a kind of Systole, and Diastole, are that in its most subtle parts they are discernible long after its being taken out of the sea till the total evaporation of all its moisture

bigneſs of theſe, tho', in time, it might have equalled it, three other long, but ſmaller muſcles, doubtleſs of the ſame kind, but thin and ſoft as a herring-ſcale, hanging on the ſide of this branch

Concerning the quickneſs or ſlowneſs of the growth of theſe ſeveral vegetables, nothing can be advanced very poſitively, but of a certain ſort uſed in the Weſt-Indes for burning lime, father Labat relates, that he obſerved the branches to grow four or five foot in two years, tho' never above the ſurface of the water, yet growing there upon much higer grounds than hath fallen within our obſervation here The branches on reaching the ſurface of the water, ſpreading themſelves as it were to avoid the air, for which their porous bodies are not adapted If it be aſked, whether theſe ſea-trees bear any thing, which may properly be called a fruit or ſeed, though nothing like it has occurred to me or any of my correſpondents, yet along our ſea-coaſts one meets ſometimes with ſubſtances which favour the affirmative Among theſe I particularly reckon one, to which I ſhall take the liberty of giving the appellation of Faba-marina, a ſea-bean It is of the ſize of a cheſtnut, orbicular, yet flat, or as it were compreſſed on both ſides Its colour is a dark brown yet in the middle, at the junction of the ſhells, it is variegated with a circle of a ſhining-black, and cloſe by that another of a lively red, which have a very pretty effect The inſide of the ſhell is entirely black, but the kernel is of a pale yellow, and in taſte, when dried, not unlike a French-bean, ſo that could they be had in great quantities, a very good uſe might be made of them Mr Frederic Arentz, ſuperintendent in Syndfiord, who lately ſent me a ſample of them, ſays, that they were found among the Tang, and other ſea-weeds, which had been thrown up, and driven aſhore by the wind and waves, from whence they might be concluded to belong to the ſea, unleſs they are to paſs for an Indian vegetable of the tribe called Pediculus Elephantinus, which, by the loſs of ſome ſhip, was, in the courſe of time, brought to this coaſt But having received ſome of theſe beans from another virtuoſo, who lives ſome miles from hence, the arrival of them on this coaſt, is more uſual, than agrees with any ſuch opinion As to bringing this vegetable from the oppoſite coaſts of America, whence wood and the like are known to be

Voyage aux Iles de l'Amerique Tom II p 337

Sea-bean

driven towards Iceland, this is ſo long a voyage, that the beans would infallibly putrify, or at leaſt be damaged before their arrival, which however is not the caſe, the taſte being, as is already obſerved, exactly that of the French-bean, without the leaſt mixture of the ſaline property An account of this exceeds my comprehenſion, but it is ſo with the ſea-trees themſelves, or with their ſhoots and buds, which may be looked upon as their leaves They are quite inſipid, tho', till dried, not without ſmell Concerning theſe ſea-beans, I ſhall further add, that the famous Happelius mentions ſome marine berries without taſte, growing on thoſe weeds, which the Spaniards call Sargaſſo, and the Dutch, ſea-parſley, with which the ſea near Cape Verde is overgrown for ſeveral miles

In Mundo Marial I i Lib ii cap 6

S E C T IV

From the deſcription of the above marine vegetables, or trees, eſpecially the pieces four, five, and ſix, they may be premature corals, the conſequence of their inward and outward parts being ſuch, that the principal or only difference lies in the want of hardneſs If I could be convinced that the corals are not originally hard, but gradually become ſo, by a kind of petrefaction, I alſo ſhould ſubſcribe to that conjecture, but what ſuſpends my aſſent is *, that among the northern corals, ſome plants, which from their ſmallneſs may be judged to be young, yet in their firſt vegetation ſeem of a compleat hardneſs. This is confirmed by Pelſchoor, who ſays, " That the divers, who have been among the coral buſhes under water, found none ſoft, but of the like hardneſs as afterwards " Thus it is not the air which indurates them as O Wormius imagines Soliditatem demum debitam, ab aere ambiente acquirit This from the two following verſes, appears to have been alſo the opinion in the times of Ovid

Northern corals

Gyrocin chy ronic Lib ii cap x p 153

In Muſæ p 231

Sic et corallium, quô primùm contingit auras,
Tempore durescit mollis fuit herba ſub undis

Metam Lib xv

* Sir Thomas Brown in his Pſeudodoxia, or Inquiries into Vulgar Errors, Lib II cap v p 72, where he juſtly rejects the opinion of corals hardening after being brought into the air, yet believes that the ſaline petrific ſpirit in the water, does not at the ſame time operate univerſally on all the parts of a plant All coral is not hard, and in many concreted plants, ſome parts remain unpetrified as wood

Among

Among the Greeks they were not improperly called λιθοδένδρα, i. e. ſtone-trees, ſtone in ſubſtance, and trees in growth and figure. Among the branches of the ſeveral northern vegetables in my poſſeſſion, hang ſeveral ſoft filaments, about three inches in length, and the bigneſs of a ſtraw, theſe I look upon to be other marine plants different from the coral, tho' their colour, like that of the coral, is of a pure white. I have alſo perceived a brown oil or ſap to diſtil from the orifices of a coral capſula, which, as far as it reached, made a viſible alteration in the whiteneſs of the coral. I ſhall now exhibit a conciſe view of my collection of northern coral-plants, which were hauled up in the fiſhing-nets, both here and in Sundmoer.

1. A piece half an ell in length, and a quarter and half in breadth, its ſhoots open and expanded, with pretty large flowers, or ſtones, its colour perfectly white.

2. A thick piece almoſt round, with its twigs intermingled like a thorn, the ſtones ſmall and black, all the other parts yellowiſh.

3. This is a quarter and half long, and a quarter of an ell in breadth, implicated almoſt like the former, but flatter, entirely white, the flowers much larger than the former, ſome of them even exceeding a ſhilling, and likewiſe expanded like a flower in full bloom, for which ſingular beauty I cauſed a draught of it to be taken.

4. A piece of conſiderable thickneſs, the main ſhoot much ſtronger than the former, with a large and globular node, like the capſula of a flower before its bloom, but the other twig has open ſtellated flowers, with a cavity larger than the former.

5. A ſmall elegant coral ſhrub, with flat ſhoots, being an exact repreſentation of the extremities of a ſtag or rein-deer's antlers, adhering to a ſtone.

6. Another of the ſame kind, likewiſe growing from a ſtone, of a greyiſh colour, as is the former.

7. This is very tender, being a plant juſt beginning to open the ſtone.

8. The like, but more expanded.

9. This is no bigger than the tip of the finger, but formed in a manner, the like of which I have never ſeen. It ſomewhat reſembles


C
F
G
D
E
B

Pl. 158

Kinds

ſembles a ſmall funnel, and its ſides form a beautiful web like the fineſt filigrin work, of a ſtraw-colour

10 Of the ſame colour as the former, flat, with ſeveral pretty indented ſhoots, about a finger in length, and half as broad, but appears to have been much larger before it was detached from the body of the plant, which, when entire, muſt make a very beautiful appearance. Fig G

In Nordland are ſometimes found coral plants or ſhoots, of which one ſide is red and the other white, but, having never ſeen any, I cannot warrant the certainty of it, but I have a brown ſtone of the bigneſs of two fiſts, incruſtated with coralline ſubſtances, the external colour of which is carnation, but within it is of the whiteneſs of ſnow, it conſiſts of ſome hundreds of great and ſmall round boſſes or buds cloſe to each other, and forming an agreeable figure Very probably theſe would have been bigger had they remained longer in the water This piece I account a Madrepora abrotanoides tuberculis horizontaliter poſitus, and in a collection of the naturalia of Norway, I have ſince ſeen larger and taller plants of this nature Some other kinds

The fiſhermen often ſell coral buſhes to the apothecaries at Bergen, and, upon being aſked, what is their opinion about the origin and growth of this marine vegetable, they anſwer, that ſometimes a white drop is obſerved to fall from the branches of the old coral, as well as from the ſea-trees, as if it were milk or ſeed, and where this falls a vegetable is produced according to its ſpecies This account is in ſome meaſure, confirmed by this, that the vegetable, number ſeven, has under it a white and flat macula like a root, ſpreading to the extent of the plant The ſame likewiſe is further atteſted by Tavernier, in his travels to India, where he ſpeaks of the coral-fiſheries in the Mediterranean, but he is miſtaken, in imagining that not the leaſt ſprig of it was to be found in the whole ocean, our northern coaſts manifeſting the contrary As to its medical uſes it has the character of being abſorbent, refrigirative, emollient, aſtringent, and ſtrengthening, which may be true, when the tincture of it, conſiſting of the extracted ſalts or oil, is adminiſtred inwardly, but, that the little beads, made of the coral (they not being as ſome imagine, fruits or little berries growing thereon,) are endued with any ſuch ſingular

gular virtue that when applied externally, or hung about the neck, they are a preſervative againſt the apoplexy, the plague, and other contagions, I cannot admit, having no evidence of it, but muſt leave it to reſt upon its own credit It is certain that the dealers in coral at Genoa, and Marſeilles, have a great vent for their commodities in the eaſtern countries Tournefort ſays, that all over the eaſt they wear necklaces and bracelets of coral beads brought from Marſeilles Poſſibly could white coral be brought into faſhion, a diligent ſearch might procure as great a quantity in our ſeas *

CHAP VII

Of ſeveral kinds of Gems and curious Stones in Norway.

SECT I *Of Pebbles* SECT II *Marble of different fineneſs and colour, Spar, or glittering ſtones, Alabaſter, Chalk-ſtone, and the like* SECT III *Sand-ſtone, Mill-ſtone and Slate* SECT IV *Talk* SECT V *The Magnet* SECT VI *Amianthus, or Aſbeſtos* SECT VII *Pyrites, and Quartz or Marcaſite* SECT VIII *Cryſtal and Iſinglaſs* SECT IX *Granate, Amethyſt, Chalcedony* SECT X *Jaſper and Agate* SECT XI *Thunder-bolts, and other figurated ſtones* SECT XII *Some ſtones plainly indicating their ſubſtance formerly to have been ſoft and fluid*

IN the order I propoſed after the vegetables and plants in Norway, follow the ſeveral ſpecies of ſtones, with the ſeveral metals and minerals reſident in them, but in this ſeventh chapter, I ſhall confine myſelf to the former, referring the metals and minerals to the enſuing

SECT I

Of Pebbles

It is the leſs neceſſary to dwell upon the common pebbles, of which the mountains here and in other parts chiefly conſiſt, they being well known, and I having offered my thoughts concerning them in the ſecond chapter, on the origin, formation, and different figures of the ſaid mountains, but one particular concerning theſe pebbles muſt not be omitted, which is, that a certain brown

A periſhable kind of pebble

* Concerning the white coral fiſhed for in the lakes of Numidia, and which differs only in colour, Dr. Shaw, in Tom II App p 12 of his travels, ſays, that it is scarce, but whether it bears a higher price there, I am not informed

kind of them decays with age ſo like old wood, to which, in its incurvated veins and channels it is not unlike, diſſolves between ones fingers, drops from the mountains into the ſea, and ſometimes occaſions the afore-mentioned calamity of a diſruption, ſo that the traveller round the Norway-coaſts, may find ſufficient proof to confute thoſe viſionaries of all ages, who have imagined the world to be eternal, and theſe proofs may be drawn a priori: For if the world were eternal, its decline could not be ſo conſpicuous as it is, within the few centuries, which we can compute with certainty. Time, the voracious conſumer of all things, exerts its corroſive power every where on the hardeſt rocks, but more remarkably in certain places, and whoever has lived any time on theſe coaſts muſt have obſerved the ſtones diſſolved, and the ſeparation begin in the veins, where the pores and ſofter ſubſtance ſooner yield to the daily impreſſions of the air and ſun. In many places the northern grey and black pebbles are intermixed with iron, copper, lead, ſilver, and even gold, of which we ſhall treat in the ſequel. Great quantities of theſe pebbles are at preſent uſed for building houſes, walls, and incloſures, eſpecially in and about Bergen, the neighbouring mountains furniſhing them with little labour, nature itſelf having as it were prepared them by fiſſures, into which, the wedges being driven, ſuch flat angular pieces fall of, that without being ſhaped by the chiſſel, they ſuit one another ſo well, as to form a compact wall. In ſome places, eſpecially at Gloppen in Nordfiord, I have been amazed to ſee whole mountains conſiſting of theſe pebbles naturally divided, and as it were cloven, almoſt of equal ſizes, that is, from two to three cubits each, as if they had been ſawed both longitudinally and tranſverſally. Theſe pieces are eaſily lifted with two hands, and reſemble the ruins of an old wall. Mr Buffon ſpeaks of a mountain of the ſame nature near Fontainebleau. Theſe northern fragments lie near the creeks, and being eaſily embarked, might load ſeveral thouſand ſhips, the quantity being ſufficient to build large cities. How theſe regular fiſſures and ſeparations may moſt rationally be ſuppoſed to have happened, ſoon after the deluge in the originally ſoft, and afterwards gradually indurated pebbles, I have offered ſome conjectures in the ſecond chapter, which treats of the ſoil and mountains in general,

general, where I likewiſe conſidered the diſruptions or breaks of mountains When a part of a rocky mountain, being undermined and detached, falls from its vaſt height, and in its fall happens to ſtrike on a hard ground, and is broke into ſome hundreds of ſmaller pieces, this collective body of fragments is called ſtenur, and the innumerable points and angles of thoſe broken ſtones render the roads extremely troubleſom, tho' ſometimes they are obſerved to lie in ſuch ſymetry, that their former coheſion may be judged from their concave and convex ſides In the pariſh of Houg, three Norway-miles from Bergen, about twenty years ago, a very ſurpriſing accident happened to a man, who walking under a mountain, was on a ſudden entirely covered with the fall of ſuch a congeries of large ſtones, which formed a kind of vault around him Here he remained unhurt for ſeveral weeks; his friends, who by his outcries had found the place of his confinement, knew not how to extricate him, the ſtones being immoveably large They reached him meat, and drink, for ſome time by means of a pole, thro' the crevices, but at laſt, the ſtones fell in and cruſhed him

Stenur

SECT II

Marble of ſeveral kind

Marble, which in moſt countries is ſo ſcarce, and bought up at ſo great a price, is found here in ſeveral places, and in ſuch quantities, that if all Europe were to be ſupplied from hence the quarries would not be exhauſted, for ſeveral ridges of mountains conſiſt almoſt wholly, or, however, chiefly of marble, upon breaking the lapidious incruſtation, which is a porous ſubſtance, and about an ell or two deep, as a tegument to the more precious marble, in compariſon with which, it appears to have a kind of foam or froth, interſperſed with ſmall orbicular cavities, as the ſurface of melted wax, or the like after its induration I have elſewhere confirmed the opinion of the liquefaction of the rocks, as built on other unexceptionable grounds, excluſive of theſe incruſtations Had the inquiſitive Mr Tournefort reflected better on this truth, and the conſequences which may be drawn from it, he would not have been under a neceſſity of aſſenting to the ſtrange poſition of the vegitation of marble, to account for ſome ſhoots and excreſcences of marble found in a cave on the iſland of Antiparos,

ſome

ſome depending from the roof of a cave, others ſhooting out of the ground like trees or plants, which he actually repreſents them to be His words are, Il ſemble, que le nature nous avoit voulu montrer par-la comment elle s'y prend pour la vegetation des pierres, il ſemble, que ces troncs de marbre vegetent, car outre qu'il ne tombe pas une ſeule goutte d'eau dans ce lieu, il n'eſt pas concevable, que des gouttes tombant de 23 ou 30 braſſes de haut ayent pu former des pieces cilindriques terminées en calotte, &c So far he is right, that another origin of thoſe figures muſt be ſought here, than theſe Stalactites, as they are called, or drop-ſtones, which are frequently found in ſubterraneous caverns, yet there is no neceſſity of recurring to the vegetation of marble, a third cauſe offering itſelf, that theſe long ſhoots and drops are unqueſtionably an immediate work of nature, and may, or rather muſt have been produced at one time, and if they muſt be called vegetables, they may have ſprung up in a night, like muſhrooms, or perhaps, in an hour, or even a minute; and that during or immediately after the deluge, when the detached or liquefied ſtony ſubſtances begin again to ſettle and conſolidate In that caſe, it is not in the leaſt improbable, that ſome of the ſofteſt part of the marble, conſolidating laſt, ſhould meet with a reſiſtance from theſe parts of the marble, which had already ſubſided, and run into theſe ſhoots, cluſters, and other figures, in which they appear at preſent This is moſt evident in marble and other hard ſtones, not only from other indications, for they manifeſtly contain ſolidum intra ſolidum, but particularly from the beautiful blendings of their colours, and ſpots, veins and ſtreaks, like a dried mixture of oil colours, which, when cut through, ſhew the like intermingled ſtreaks, as in our marble quarries I myſelf am poſſeſſed of ſuch a piece of artificial marble, though I confeſs it is much dearer, and deficient in ſolidity, which only it can obtain in the laboratory of the ſupreme maſter of nature *

* Poſſibly the ancients had the art of giving it its proper hardneſs, as muſt have been the caſe if we ſuppoſe thoſe vaſt columns and obeliſks of Egyptian marble forty eight feet in height not brought to Rome in one entire piece, which appears difficult if not impoſſible, but to have been ſuch in artificial gravite Dr Shaw, in his travels to the Levant, Part II Ch IV p 81, 82, ſays, ſome have imagined Pompey's column and the obeliſks of Rome, and Alexandria, to be an artificial compoſition of cement and ſtands caſt in a mould

Moſt of the Norway marble-mountains are ſtill unknown as ſuch, and will in great meaſure continue to be of no advantage, except thoſe which are contiguous to the ſea or the creeks, for the ready ſhiping of the marble I omit the mention of thoſe marble-mountains which I have obſerved in my journies, particularly at Lillemos in Walders, and elſewhere, much leſs ſhall I take upon me to give an account of the new marble-quarries undertaken at the charge of colonel Eigtveds, architect to his majeſty, and other proprietors, not far from Drammen, in the dioceſe of Aggerhuus But, inſtead of theſe, I ſhall take notice of thoſe marble-quarries in the dioceſe of Bergen, which have been broke up within this century, chiefly by the family of Lilienſchiold, and partly carried on by others, of the produce of which the palace of Chriſtianſberg at Copenhagen is an illuſtrious inſtance. Some thouſands cubic feet of northern marble, have already been exported for that edifice, eſpecially from Muſterhaven, and continue ſtill to be carried thither, beſides the demands from England, Holland, Germany, and the countries on the Baltic, and even from Sweden itſelf, which is in no want of good marble, tho' the Norway is eſteemed better, notwithſtanding its extreme hardneſs renders it very difficult to be wrought, and tho' it cannot, as ſome pretend, to vie in whiteneſs with that of Carrara in Italy, or in fineneſs with that of Sicily and Egypt The chief marble-quarries hitherto opened in this dioceſe, and their ſeveral kinds, are as follows

Account of the principal marble

1 Hopcholm, not far from Bergen, produces marble of a good white, likewiſe blue and white, alſo a greeniſh kind, with red ſtreaks

2 Wikeneſs in Storoe, ſix Norway-miles ſouth of Bergen The marble of this quarry is red and white, very fine and ſolid, but very difficult to be hewn into ſquares, likewiſe white intermixed with green with ſulphur-coloured veins, a kind of grey and white jaſper, green, with red ſtreaks of agate, laſtly, black and white, all very difficult to the workman

3 Muſterhaven, ſeven Norway-miles ſouth of Bergen, not far from the noted high mountain Siggen This quarry yields blue marble with white ſtreaks, dark blue with the like variegation,

green

green with greyiſh veins, likewiſe an azure marble This is eaſier to the chiſſel than in moſt places *.

4. Salthellen, four Norway-miles from Bergen, affords a white marble, and eaſily wrought, but is not ſo firm as that of Hopeholm, and breaks into longiſh blocks, it alſo affords a grey and white, likewiſe a dark grey ſtreaked with white

5 Hillebrud, ſeven Norway-miles from Bergen, the marble of this quarry is white, with a yellowiſh tinge, it likewiſe produces a light-blue and white, both kinds very compleat, and in large blocks

6. Stourſoen-quarry, one of our miles from the monaſtery of Halſnoe, yields black-marble ſtudded with white ſpots, and its blocks are large and compact

7 Selloe, on the other ſide of this monaſtery, produces blue and white marble, in larger blocks than are to be met with any where

To this tribe of ſtones belongs likewiſe the touch-ſtone, Lapis-lydius, being a kind of black-marble, alſo alabaſter, which I have met with in my journey to Sundmoer, near Borgenſund, but of a greyiſh caſt, and only in ſmall pieces, lying as an infuſed adventitious matter betwixt the ſtrata of hard pebbles, by the peaſants it is called Hejetel, under which name I have already ſpoke of it in the 2d chapter, concerning the origin of mountains Under this ſpecies may alſo be comprehended the ſeveral kinds of ſpar, or other ſhining ſtones, like what is called Katzenſilber, which are eaſily reducible to a white powder, as are the chalk-ſtone, cement-ſtone, and ſtucco-ſtone, to which uſe likewiſe the ſtrictures of marble, which fly off in the quarries are applied.

SECT III

Sandſtone is found in ſeveral places, of a clear and dark grey, yellow and brown, of a fine and coarſe grain, and is uſed either for building or for grind-ſtones, which laſt are in greateſt perfection at Hædæmark, but on account of the ſituation, the exportation of them is difficult, tho' conſiderable quantities are brought Sand ſtones

* I was lately preſented with a piece from this quarry, in which red, green, and white veins were intermixed, in a more beautiful manner than any I had ever ſeen, the only defect is the ſoftneſs of the green veins, which hinders a perfect poliſh

to

to Skeen, and from thence carried abroad The parish of Odde in Hardanger, affords as fine and firm sand-stones as ever I saw, but not in any great quantities I have been lately informed, that in the parish of Nordal in Sundmoer, there are large mountains entirely consisting of yellow and red sand-stones

Mill-stone. Mill-stone, which indeed is but another sort of sand, consisting of grosser substances, but the texture thereof is both more compact and smooth, is exported from Guldbrandsdale, Syndford, and other places

Baking-stone. Hardanger likewise affords the best Bagsteheller, i e Baking-stone, a flat thin and smooth stone, which being rounded, bread is baked on them, which is likewise done on iron plates These flat and thin stones likewise begin to be used for covering houses and churches, as slate is in other places

This in some parts is found in such prodigious plenty, that not only the whole ground on which the city of Christiania stands, but the adjacent country is little else than slate, Collæa lapis fissilis, splitting into laminæ, or consisting of a succession of laminous strata But hereabouts the pieces are so small, as not to be applicable to any particular use, nor have coals been found under it either here or elsewhere, as was supposed, from the similarity of the substances, and the black loom intermixed with it being somewhat like coal, besides the circumstance of its splitting in the same manner as coal

SECT IV

Veeg-steen (soft or Talc-stone) both light and brown, and the finest sorts of it otherwise called Talksteen, Grytsteen, and by some Blodgryte and Cloversteen, being very soft and easy to be cut, hewn, or sawed, are to be found almost throughout this and all other provinces of Norway, but not every where in such large pieces as in Stavenger, and the lordship of Sundenhord, from whence some shiploads were lately carried for the palace at Copenhagen *, and the late famous and stately cathedral of Dront-

* The Talksteen is sometimes found in and along with the hardest pebble stone Near Malmberg is a deep cavern in a mountain, now almost exhausted, but formerly full of it This corroborates what I have before said, De solido intra solidum, and shews the probability that all lapidious masses were formerly soft and intermixed

heim was ſaid to be built of this ſtone, as I have here found ſeveral churches, and other buildings of the ſame. This ſtone does not conſiſt of ſand or loomy particles, but of a fine ſlimy compact ſubſtance, which may be pulverized, when it ſhines like ſoap or tallow, but in the air becomes porous, and loſes it gloſs, as I have obſerved on the outſides of old churches, which, by length of time, looks as if they had been built of pumice-ſtone; this ſtone however is almoſt imperiſhable, even in fire, and on that account is by ſome uſed for hearths, ovens, and beacons In Gulbrandſdale, cups, pans, pots and kettles, to the bigneſs of half a tun are made of it, as veſſels of this kind not only retain the heat, but according to Bromel, give a better taſte to what is boiled therein, than utenſils of any other ſubſtance Of the dark green Talc, which is likewiſe uſed for caſting variety of figures, I have ſeen images, and other kinds of ſculpture, with as fine a poliſh, and in every reſpect as ſightly, as if of marble or ſerpentine, yet the latter would have taken up thrice the labour and time, for the Talc-ſtone, eſpecially of a good kind, is worked much eaſier than wood itſelf Near Stavenger, is found a kind of Talc-ſtone, of ſuch a whiteneſs, that it is begun to be uſed there for powder, as it may be pulverized to an impalpable fineneſs, and I am inclined to think it would ſucceed better in painting than ceruſe I alſo recollect to have read, if I miſtake not, in Tavernier, that the principal perſons in Armenia, make uſe of a white ſhining Talc-ſtone for painting, and as it were laquering their beſt apartments, and this Talc ſeems to be of the kind in queſtion Of the powder of Talc-ſtone, which is like to the fineſt ſoap, and Talc-oil, an ointment is made for rendering the ſkin cloſe and ſmooth. The Muſeum Wolmianum mentions a kind of Norway Talc, with gold veins, but this muſt be extremely ſcarce.

In Lithographia Norvegica, p. 26

SECT V

In the iron-mines near Kongſberg and Skeen, and likewiſe in ſome other places, is found that wonderful ſubſtance called the magnet, or loadſtone, and in ſuch quantities, that ſome tuns of it are exported, eſpecially to Amſterdam Ol Worm, beſtows on the northern loadſtone, the epithet of Viribus inſignem, whe-

The magnet or loadſtone

might further be ſaid on it does not belong to this place, I therefore proceed to inſert what little I know of the lapis ſuillus, or ſwine's ſtone, a production peculiar to Norway and Sweden It derives its name from its efficacy in the oraſinke, a diſtemper incident to ſwine, it is alſo with as good reaſon by ſome called lapis fætidus, as when rubbed againſt any ſubſtance, it emits a nauſeous ſmell The nature and texture of its parts is vitrious, nearly like the cryſtal, it likewiſe ſhines, but is brown, with a large mixture of ſulphur, which may be the cauſe of its fætid ſmell In an iſland in Great Mios upon Hedemark, are whole mountains of this ſtone, which when galloped upon by ſhod horſes emit a violent ſtench

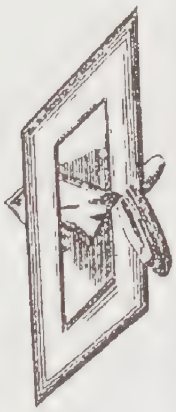
SECT VI

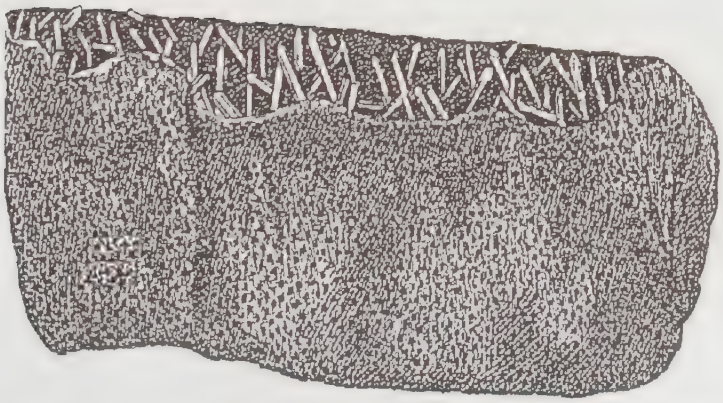
Amianthus or Aſbeſtos.

That the amianthus or aſbeſtos, which makes an incumbuſtible linnen or paper, is to be found in the pariſh of Waldens, I can affirm from my own experience on this occaſion, I had ſent for ſome ſamples of that wood, which was ſaid to be petrified by a certain water before-mentioned. Accordingly a large parcel of it was ſent to me, and at firſt I could have compared it only to hazle, which had lain a long time in the water, but upon a narrower inſpection, and drawing out ſome of the filaments, I found it was no petrified ſubſtance, but an amianthus, and far finer than the Greenland ſtone-flax, which the Rev Mr Egede, in his account of his miſſion, relates to be there uſed as wicks in the lamps, without being in the leaſt waſted whilſt ſupplied with oil or fat This Sundmoer amianthus which is produced in a mountain in Birkdalſwamp, deſerves like that of Siberia, and even better, to be called ſtone-ſilk, rather than ſtone-flax, its fibres being both ſofter and finer, I alſo made a wick for a lamp of it, and it was not conſumed, but its light being much dimmer than that of cotton, I laid it aſide I have alſo in my poſſeſſion a piece of paper of this aſbeſtos, which when thrown into a fierce fire is not in the leaſt waſted, excepting only that what was written on it totally diſappears The manner of preparing this ſtone-ſilk, or ſtone-flax is briefly this, the ſtone after being ſoftened in water, is beaten with a moderate force, till the fibres, or long threads ſeparate from each other, afterwards they are carefully, and repeatedly


A

B





peatedly waſhed till cleared of all terene particles, then the flax is dried in a ſieve that the water may run off the ſooner, all that remains now, is to ſpin theſe fine filaments, wherein great care is required, beſides which, the fingers muſt be ſoftened with oil, that they may be the more ſupple and pliant That Kircher and others ſhould have miſtaken this ſtone for the alumen plumoſum *, and imagined it to be an allum fire-proof, appears hardly probable, eſpecially as allum has a very acrimonious and peculiar taſte, which this ſtone is ſo far from having, that it is as void of taſte as any other ſtone can poſſibly be.

SECT VII

A phyſical ſingularity here, is, that a country thus abounding in ſtones has no flints, ſo that thoſe uſed in fire arms are imported from Denmark, or Germany In all my circuits, I have never ſeen a flint-ſtone in Norway, and all whom I have enquired of agree that if there are any, they never have been diſcovered: But on the other hand, the mineral mountains produce a kind of pyrites or fire-ſtone, namely, the quartz, as it is called, which at firſt ſight reſembles the before-mentioned ſpar, or ſuch glittering vitrious ſtones, but that it is of a different kind appears from hence, that in the fire it is not reduced to lime or ſtucco as thoſe are, but becomes fluid, and is therefore uſed in the glaſs-houſes

No flints.

Fire ſtone or quartz.

SECT VIII

This quartz or marcaſia, is of very near affinity to the Norway cryſtal, of which there are great quantities both here and in the other provinces, and of a larger ſize than moſt of thoſe in Switzerland, Bohemia, and other parts The mountains are the proper native place of the cryſtals, which ſometimes are ſeen ſuſpended on them, and glitter in the ſun to the amazement of ſtrangers, but theſe are liable to be waſhed away into the rivers, and from thence into the lakes, and this is the only way I can account for cryſtal being found in the great mios, as it certainly is Mr Peter Underlin in his topography of Norway, mentions

Cryſtal Plate 15

* Dico itaque hunc lapidem eſſe compoſitum ex certa aluminis ſeu talci ſpecie, ut rotunde eum multi alumen ſciſſile aut alumen plumæ non inmerito putarint, eſt enim multo mollioribus filamentis etc Mund ſubterr in Lib VIII Sect III cap 1 p 67

his having a piece of cryſtal as a very extraordinary curioſity, of four ounces weight taken from thence, but this is trifling in compariſon with a piece found in Hardanger, and now in my hands, which is within an ounce of five pounds in weight, twelve inches in length, and ſeven in thickneſs, and I never ſaw ſo large a fruſtum of the angular and conical kind, tho' it muſt have been larger, with little projections from its ſides, which the former owner confeſſes he broke off for preſents, ſo that now there remain only four uniform angles, but two of them have ſince had the fate of the former I have ſeveral ſmaller pieces of an hexagon figure, *with the extremity terminating in a point* *, theſe regular, ſexangular, and conical cryſtals are by our peaſants called duergnagler, dwarfs-nails, from an old notion, that theſe were nails which the dwarfs, who, they imagine, formerly dwelt in the mountains, threw away as quite unneceſſary to them, as being without heads But the general name for the cryſtals here are biergdraaber, mountain-drops, which name correſponds with the accounts of the naturaliſts of the origin of cryſtals, and happily expreſſes that ſort which hang on the mountains, in the ſhape of grapes, or other indeterminate figures On the other hand, I know from experience, the afore-mention'd long and regular pieces, which are all ſexangular, are generated in a chalky porous ſtone, in ſhape like a drop-ſtone, having a piece of it which was found in a mountain, near the pariſh of Forde in this province of Sundfiord, this is a little larger than a hand, though twice as thick, but filled both longitudinally and tranſverſally with theſe minute priſmatic cryſtals, hundreds of them projecting, as if drawn through with a larding-pin, ſo that I place a great value

* How this moiſture of the quartz, or marcaſite, dropping from the mountains becomes indurated, and in time produces a vitrification or cryſtalization, is in ſome meaſure illuſtrated by J. H. Henkel, in his pyrotology, chapter 5 page 354 and likewiſe the cauſe of its hexagonal figure in the manner of the ſaline rays, ibid p 362 Likewiſe Kircher, in Mundo ſubterr Lib VIII Sect 1 p 25 Act Societ Hafn Tom III p 28 Leibnitz Protog Sect XXVIII p 44 Within theſe mountain drops, is ſometimes incloſed another heterogenous ſubſtance ſhining like ſilver, and by the ignorant thought to be ſo I have ſome ſuch pieces, which I accounted firſt rare curioſities till a more experienced friend of mine ſhewed me, that upon being rubbed or pulverized their luſtre vaniſhed, and the ſuppoſed ſilver turned into a terrene ſediment Argenti flores appellant fodinarum magiſtri, albis guttulis, quæ cryſtallis [illegible] madent et [illegible] fermentum cluent argenti, apud eorum nonnullos maximam habent æſtimationem etiam raritatis titulo Quamvis autem haberi et eſſe fortaſſe poſſint architectonica argenti, nondum tamen id penitus obſervationes perſuadere voluerunt Aloyſ Com Marſili Danub Pannon T III page 168

upon this piece of ſtone, as a manifeſt mother of cryſtal * Were it not for the yellowiſh caſt, too common in theſe northern cryſtals, like thoſe of Bohemia, and Hungary, they might juſtly deſerve the appellation of Norway-diamonds, which Mr Arent Berendſen confers on them, for the original eſſence and formation of the diamond, namely, a filtrated, vitrified, denſe, indurated mineral juice is likewiſe that of theſe cryſtals, the whole difference being, that the filtration here is leſs perfect It appears, however, that as nature in other things ſometimes deviates from her general rule, working either more delicately or coarſely than uſual, ſo the northern cryſtals may be accounted ſuch deviations, from her general rule in the formation of diamonds, or Norway mountain-drops A certain officer of reputation of the diſtrict of Hardanger, a few years ago ſent to London two ſtones found there, in order to have them made into a pair of ear-rings for his lady When the merchant to whom he had given this commiſſion, called upon the lapidary for them, he was aſked what he looked upon thoſe ſtones to be, the merchant anſwered, Norway-cryſtals, then replied the lapidary, give me a note of hand that they ſhall not be paſſed for real diamonds, which the merchant very readily did. I mention this little ſtory, partly to ſhew quantum eſt in rebus inane, and how, in matters which are highly eſtimated, and ſometimes deſerve ſo to be, the world is more governed by imagination than reality, as otherwiſe there could not be at leaſt that

* Cryſtallus montana (prout ex pluribus obſervationibus feliciter didicimus) non eſt aliud quam ramificatio ſeu propagatio duriſſimi ſilicis, quartz, lactei ſæpius coloris ac opaci, cujus dorſum ſi compluribus compreſſum ſtratis, interius tamen aliquid vacui ſortiatur, intra quod libere valeat in ramulos propagari, tunc generatur cryſtallus (non vero ex aqua gelu in montibus vehementiore concreta, (ut Plinius, Seneca aliique non pauci tradiderunt) Quod ſi cinnabris effluvia ipſius ſeſe commiſceant vegetationi (quod nobis plerumque videre contigit in argentifodinis; tunc eidem amethyſti colorem non tam raro impertiunt Et rem ſane veroſimiliter ſic ſe habere, per Helveticas Alpes ad montem S Gotthardi, anno 1682, iter facientes amplius animadvertimus, ac edocti ſumus ibi a foſſoribus cryſtallos eruentibus Hi ſiquidem in pluribus nobis monſtrarunt ventriculum ſeu cavitatem quandam, cujus parietibus majori ex parte ſubſternebatur ſilex ſeu quartz, intra illam cavitatem vegetans, cujus puriores ac tenuiores partes filtratione quadam à reliquis ſegregatæ ac ſenſim concreſcentes aſſurgebant ſeu diſtendebantur in conos cryſtallorum angulares, Aloyſ Com Marſili D nub Pannon Tom III p 89 This is further worth obſerving, that as the effluvia of cinnabar veins in the mountains, by the tinge, which they communicate to cryſtals, make amethyſts of them, the turquoiſe and emerald in the like manner owe their colours to vitriol P I page 100 The abſurdity of that opinion of Pliny, Seneca, and other ancient naturaliſts of the formation of cryſtal like ice, by an intenſe froſt, has been more than ſufficiently expoſed by Sir Tho Brown in his vulgar errors, Lib II cap 1 p 37

immenſe diſparity in the price of our native and the Oriental ſtones. I have among my ſmall collection of Norway-cryſtals, a piece ſo clear and pure, and withal not vitrious, that in the judgment of the connoiſſeurs, it might be cut into a very exquiſite jewel *.

Marienglas Iſinglaſs.

Among the Norway-cryſtals is alſo reckoned the Marienglas, Iſinglaſs, or Ryſglaſs, as it is called here, being moſtly found in Ruſſia, where, on account of its tranſparency, it is uſed for window-panes. This is a particular ſpecies of ſtone lying in ſtrata, or flakes, or like ſo many ſheets of paper, and as eaſily ſeparated. I have a piece of dark red, which is very uncommon, it being generally clear or greyiſh. Wormius, who had never ſeen any of this colour, page 56. of his Muſæum, ſays, that this Ruſſian-glaſs is ſometimes found in marble, and ſometimes in hexagon figures, like the above-mentioned mountain-cryſtals.

SECT. IX.

Granates.

Granates, which derive their name from the ſimilarity of their dark red colour, with that of the kernels of the pomegranets, are found at Kongſberg, in Gulbranſdale, Oſterdale †, and other parts, and not ſeldom incloſed in other maſſes of ſtone, and Mr. Bromel ſays, that in Norway, as Jempteland, many mill-ſtones are mixed with granates, but the few in my poſſeſſion, or which I ſee elſewhere, and are of the ſize of a middling hazle-nut, with many angles, have no particular luſtre, and are foul, or as the phraſe is, not ripe. Thoſe mentioned by Olig Jacobeus, among the northern curioſities in the Muſeum regium, I ſuppoſe, make a better appearance.

In Lithograph. Suec. P. 63.

Page 34.

Amethiſt.

Norway amathiſts are likewiſe mentioned there, but with the addition that they want the hardneſs of the Oriental. The ſame author, page 32, likewiſe mentions another ſtone, which he thus deſcribes, Pyrites aureus teſſelatus, maculis purpureis ac hyacinthinis hinc inde diſtinctus ex oſterdalia Norvægiæ.

* Cryſtallos puriores Americanis ſuppeditat Norvegia noſtra, ut ex ſpecimine tranſmiſſo videbis. Ep. Ol. Wormii, Tom. II. p. 82[illegible].

† Reperiuntur etiam Norvegiæ dodecaëdri torum impuriores, vena talci plerumque infecti, colore ad nigredinem tendentes, ut eo primum genus Orientalium æmulari videantur, natura quandoque politi. Tantæ magnitudinis mihi unus eſt, ut ovum columbinum ſuperet. Creſcunt in vena talci tanta copia [illegible] vena ſunt juncti, lapides molares conficiunt. Ol. Worm. Muſ. p. [illegible]

The

The Ferro-iſlands afford plenty of Chalcedonies, but which are not above twice the bigneſs of a pea, very ſeldom reaching that of a hazel-nut, of which ſize I have ſome in my collection The Muſeum Womianum, page 98, mentions two of an oblong figure, and of the bigneſs of a man's thumb, and he alſo ſpeaks in the following manner of thoſe of Iceland "Chalcedonium iſlandicum cryſtalloidem voco lapidem Maſſa eſt unciarum duarum longitudine, totidem latitudine, qua latior eſt Parte qua cauli adhæſit, ſaxo conſtat albo, duro, cui nigredinis quidpiam permiſtum, ex quo efflorescit cruſta quædam calcedonica, craſſitie calami ſcriptorii Hæc vero ex ſe papillaceas quaſdam ſtrias protrudit ejuſdem ſubſtantiæ, externa ſuperficie aſperas inſtar ſacchari candidi, granulis minutis micantes Parte anteriore tres ſunt papillæ, quarum media reliquis longior, una reliquis minor, verſus latiorem partem una duplicata Omnes hæ papillæ, ut et corporis ipſius tota ſuperficies ſuperior quaſi conglaciata eſt, ſplendentibus granulis cryſtallinis aſpera. Elegans certe eſt, a nemine, quod ſciam, deſcripta" Of theſe glittering and angular little grains, which are ſaid to adhere to the iſland Chalcedonies, there are frequently found deep in the earth many white muſcle-ſhells, quite full, an indiſputable effect of the deluge, theſe bodies, when liquid, having inſinuated themſelves into theſe ſhells, where they afterwards became indurated, and I myſelf have ſome of this kind in my muſæum Chalcedony.

SECT. X

Agate of ſeveral kinds are produced here, and I have ſome pieces of red and yellowiſh, which were found in Sundmoer, and the ſame abound in other places The ground near the parſonage of Findaas, is ſaid to be full of large veins of agate, but generally ſo hard as not to be wrought in any other manner than by grinding Baron Holberg, in his Preſent State of Denmark and Norway, ſays the like of a kind of hard but beautiful jaſper, found in a mountain two Norway miles N W of the parſonage of Sillejord, of which governor Wibel, in the year 1726, had a ſet of tea-cups made, for a preſent to his majeſty Frederic IV Agate.

Among ſeveral ſmall pieces of green jaſper, found in the Ferro-iſlands, Ol Wormius mentions the following "Quedam Turcoides, æmulantur, quædam Malachites, quædam in matricibus ſuis In Muſ. 1. 91

exiſtentes jucundum diſpicientibus præbent ſpectaculum---Inter jaſpides ex inſulis Feroenſibus allatas, reperiuntur etiam jaſponiches numero haud exiguo, videtur enim natura in iſtis inſulis intenta eſſe, ut onichen viridi colore tingat, verum opus ſuum ubi impedita non abſolvit remanet jaſponix, quin et jaſpidis capnitis hic viſuntur ſpecimina'

SECT XI

Figurated ſtones

Of figured ſtones I have ſeveral, ſome of which were found in Norway, but ſhall not enlarge on theſe, as not being peculiar to the country, yet, I cannot ſuppreſs the obſervations of a judicious perſon on ſome ſmall circular, and flat ſtones, perfectly ſmooth, and of a mixed ſubſtance, dark brown, yellow, and grey roundiſh ſpecks being blended among one another, but they are ſometimes found as big as a hen's egg, and by the peaſants called loſpeſteen, looſening-ſtones, from their opinion, that they are beneficial to women in hard labours They alſo pretend, that this ſtone is the ſuppoſed thunderbolt, it being found where the lightning has penetrated, and as it were plowed up a furrow on the mountains I leave this without any comment, yet I beg leave to inſert the words of the above-mentioned perſon, Mr Fred Arndtz, ſuperintendant at Sundfiord, and miniſter at Itſkevold, in a letter to me, of the 22d of September, 1750

"My Lord, I take the liberty to ſend you in the box which comes along with this, a ſmall ſtone lately come into my hands, and of which, I own the curioſity to conſiſt only in the account which the peaſants have given me of it They ſay, that the thunder darts down ſuch ſtones, aiming them at the Troll (a kind of witches, or infernal ſpirits of the night) who otherwiſe would deſtroy the whole world, and it makes uſe of theſe ſtones for bullets The reaſon on which they attribute theſe ſtones to the thunder, is, that they are commonly found in thoſe places, where the earth has been torn up by a violent thunder-clap, the uſual ſize of this ſtone is like that before you, though the largeſt, both in figure and dimenſions, entirely reſemble a hen's egg That the thunder tears up the earth into a kind of long furrows is very certain I have ſeen it myſelf here in Sundfiord, and in ſuch furrows theſe ſtones are found this the people affirm very poſitively, offering ſeveral inſtances

ſtances in proof of it I am aware, that all that is ſaid of theſe thunder-ſtones, is by many looked upon as mere fables, and I myſelf cannot entirely come into many of theſe traditions, as that in a violent tempeſt, theſe ſtones have ſtruck againſt a ſhip's ſail and dropped down upon the deck, or that a woman who was at work at her quilting-frame, when the whole houſe was ſuddenly deſtroyed by a clap of thunder, but ſhe not in the leaſt hurt, found ſuch a ſmall ſtone lying on her frame However ſome maintain the truth of theſe things, and have not the courage to refuſe hiſtorical credit to accounts of this nature, and indeed they are not entirely deſtitute of all veriſimilitude, if the production of the ſtone be conſidered, its primordial element being a ſlimy water, mixed with matter and inſpiſſated by fire, whence a petrifying juice The ſtucco works are ſuppoſed to afford a ſpecimen of ſuch a mixture, which are ſomewhat hardened by the infuſion of a ſmall quantity of water, but by the infuſion of oil acquire the ſolidity of ſtone That ſuch a materia lenta et viſcoſa may aſcend into the air is undeniable, that the lightening may have very wonderful effects in the atmoſphere muſt alſo be granted, and that a ſolid compreſſed body by its own gravity deſcends is natural But there ſeems, notwithſtanding, leſs difficulty to comprehend the thunder-ſtones formation in the earth for the wonderful force of thunder, of which there are ſo many inconteſtible evidences, and of which I myſelf have ſeen ſome in the bayliff's houſe at Turre, ſhould eaſily induce us to ſubſcribe to the following words of a learned man, Radios fulminares terram penetrantes, arenam, quam forte offendunt, in talem aliquam maſſam lapideam per vitrificationem quandam colligere I ſuſpend my judgment herein, and only add, agreeably to my deſign, that this ſtone is by the peaſants called laaſneſteine, i e looſening-ſtone, from the effects attributed to it, for the women, and eſpecially the old nurſes, imagine this ſtone to be ſomething exceeding ſacred, and it is with great difficulty they can be brought ſo much as to ſhew it, much leſs to part with it, from their perſuaſion, that beer drawn in a cup with this ſtone in it, being given to a woman in labour, facilitates the delivery, or as the peaſants phraſe is, dalaaſne, i e the fœtus is looſened, ſolvitur vinculum rumpitur" So far this letter.

Thunder

The ceraunei lapide, thunderbolts, which were formerly accounted thunder-ſtones, are now unanimouſly allowed to be ſtones artificially wrought into axes, hammers, wedges, and knives, which in the heatheniſh times were uſed at ſuch ſacrifices, as, according to their ſuperſtition, did not admit the uſe of a tool, or inſtrument of any other ſubſtance, they are found both here and in Denmark, and chiefly on ſuch eminences as were appointed for ſacrificing I have them of different ſubſtances, colour, ſize, and figure The laſt has the ſtrongeſt marks of being the work of art and not a natural form, eſpecially in thoſe which have a circular hole where the handle or graſp was inſerted

Actites, or the eagle-ſtone, is found here as in other parts in the neſts of eagles, who, probably, lay it there, to moderate the violent heat exhaling from the breaſt of the dam, the eagle being a bird of extreme heat They are generally of a dark yellow, oblong, and conical at both ends. I have one, which when ſhook, rattles, ſome ſolid body unqueſtionably being incloſed therein Of the ſeveral virtues aſcribed to it, Ol Wormius diſcourſes more than becomes him, fancy and ſuperſtition having in my opinion the greateſt ſhare in them

Mufeum

SECT XII

Stones plain ... ſhewing their ...

I ſhall now in a few words mention ſome pieces of ſtone in my collection, which at firſt ſight confirm what I have before ſaid on the origin of rocks, namely, that the ſubſtance of marble, and of the moſt denſe and ſolid ſtones were formerly, and probably at the time of the deluge, ſoft and fluid, but afterwards coagulated or ſubſided into their preſent ſituation, like metals after fuſion Of this I ſay, four pieces of ſtone are palpable proofs, the firſt has very much the appearance of a ſmall parcel of hog's-briſtles, with their thick ends inverted againſt each other, and with a ſtraightneſs which ſhews the rapidity of their fluid motion, this piece is white, the ſecond piece is a connexion of ſeveral very remarkable diſtinct quadrangular parts, each of the length of a larding-pin, but of the thickneſs of a ſtraw, paſſing through each other ſometimes longitudinally, ſometimes tranſverſally, it is of a dark brown, and vitreous The third piece conſiſts of long, fine, light-grey ſtrie, ten and more in a ſucceſſion, and others of a like fi-

r gure

gure in an oppoſite direction, compreſſed together like rays In the fiſſures are ſome ſmall ſparks of metal The fourth piece has coaleſced into the roundiſhneſs of a cake, and is compoſed of many circles, gradually contracting themſelves, and proceeding one from the other to the center, ſo that the laſt motion of the matter of this ſtone muſt have been circular, this ſtone is dark grey.

Remarkable figure of a ſtone on the mountain of Svuku

The different ſhapes of theſe lapidious ſubſtances, by caſual alterations, remind me of a particular in Oſterdale in the mountain of Svuku, on the borders of Sweden, which never fails to excite the admiration of the curious, and it may juſtly be looked upon as one of the moſt ſingular monuments of the deluge Mr Dantilas gives a good account of it in a memoir which he read in the year 1742, before the royal academy of ſciences in Sweden, and has ſince been publiſhed, of which the following is an extract, " The higheſt creſt of the mountain of Svuku in Oeſterdalen, a province of Norway, lies, according to a ſurvey taken by the barometer, above two thouſand ells higher than the lake of Famund, a water betwixt the mountains This mount conſiſts of one ſolid, hard ſand-ſtone, on the top of the mountain ſtands a ſolid huge maſs of the ſame ſtone, which bears in it many marks of a diſſolution and diſruption, which can be attributed to nothing but water For at the foot of this maſs, yet on the ſummit of the mountain towards the ſouth, are ſeveral parallel channels, three or four fingers deep, and of the like breadth, which at laſt meet, they appear to be the work of ſome miner, but upon viewing them on the ſummit, the moſt manifeſt indications ſhew themſelves, as if the water had cut itſelf a paſſage along ſome heaps of clay, ſo that unqueſtionably the true cauſe of this ſingularity is to be ſought in the impetus and agitation of the waters

CHAP VIII

Of the Metals and Minerals in Norway.

SECT I

Of the mines in general.

THAT the lapideous kingdom, in Norway, contains a vaſt treaſure of metals and minerals, is not unknown, eſpecially in this century, when the breaking, removal, and fuſion of the ſilver, copper, iron, and lead, eſpecially in the dioceſes of Aggerhuus and Drontheim, employ many thouſand hands, beſides the great profits accruing from them to the proprietors, or ſharers, excluſive alſo of the advantages to the peaſants and other landmen by burning charcoal, and bringing it to the founderies belonging to thoſe mines. That the uſe and advantage of the Norway ſubterraneous treaſures, has been ſo greatly improved within the laſt hundred years, that the produce has been doubled, is unqueſtionable, and what further proſperity it ſhall pleaſe providence to grant to the miners, for their direction and continual progreſs in theſe dark ſubterraneous tracts, where the guidance of an all-wiſe hand is as ſenſibly requiſite, as in any undertaking whatever, muſt be left to him, whoſe providence in its own time, diſtributes to every generation thoſe bleſſings, or eſtabliſhes its wealth on thoſe things of which it ſtands moſt in need, and there is not a more ſtriking inſtance than this, of the ſuperintending wiſdom, and œconomical goodneſs of God, throughout the whole ſyſtem of nature. I know not what account to make of Puteanus's pompous prediction of a golden age to the northern countries, aſſerting that betwixt the ſixtieth and ſeventieth degree of northern latitude, time ſhould diſplay a ſtore of wealth

in

in metals, ſuperior to all the treaſures that ever the eaſt afforded *.

SECT II.

Should time verify this prediction, the generation then in being muſt conſtrue it an accompliſhment of the words of Job, xxxvii 2. *from the north cometh gold*, for in the year 1697, when, although prematurely, Paracelſus's golden age was thought to be at hand, a golden mine being diſcovered, the abovementioned words were the impreſſion on one ſide of the ducats, with the image of Chriſtian V on the other. The number of them however was inconſiderable, the mine ſoon failing, but in fineneſs the gold was equal to that of Hungary And ſometime before, namely in 1644, and 1645, Mr Berenſen relates, page 274, that near Aggeſide, or in the dioceſe of Chriſtianſand, on the eſtate of Mr Chriſtopher Gios, gold ore was found †, from which thoſe ducats were ſtruck, which the foreigners would by no means believe to be of Norway-gold, from a falſe prepoſſeſſion that Norway afforded no ſuch precious metal However, Chriſtian IV to avoid the charge of an oſtentatious parade, in decking himſelf with foreign feathers, in the year 1647, ordered other ducats to be ſtruck of the ſame gold, which were called Spectacle-ducats, the reverſe of them being a pair of ſpectacles with this legend, Vide mira domi ‡

The

* I cannot ſpecify the place in his writings, having only met with it in Scaffer's Lapland, quoted from Turnæus, and it is repeated by Mr Peter Hogſtrom, in his Deſcription of Lapland

† Anno 1644, Nobiliſſ D Jo Sigfrid de Lutichau, rei metallicæ in Norv Præfectus generalis, mineram auri invenit in tractu Nedenecenſi prope portum Arendalenſem et cuniculum Barlo, nigram talcoſam, frequentibus ſplendentem micis, in cujus bonitatem cum inquiſiviſſet, invenit pondo centenarium ejus mineræ præbere auri puri marcas triginta octo, et inſuper centum quadraginta ſex marcas argenti —Aliam alterius venæ maſſam Anno 1646, quæ ignibus depurata, ex libra una, auri puri dedit drachmas ſex, præſente Reg M truſtram quod teneo minutioribus ſplendet micis et priori magis ad rubidinem vergit Adductæ ſunt ex eodem loco mineræ talcoſæ itidem ex frequentibus granulis prægnantes, quas auro ſcatere multi exiſtimant Hinc mineram Anno 1646, Regi ipſi detexit ruſticus quidam Gammel Grodewyn, i e old Grodewyn, dictus Sita fodina eſt ad portum Marede dictum (this muſt be Mardoe) extractu Nidroſienſi lapis quidam areroſus aureis ſcatens ſcintillis et granulis minutis, mihi allatus et talci aurei nigreſcentis ſquamulæ, ex quibus aurum erui volunt In argentifodinis Norv prope Regiomontum puteus Brunſwig dictus, aurum præbet, refert namque D Normand, quod A 1630, d [illegible] April [illegible], marcæ et ſex unciæ cum dimidia, auri ex eo ſim[illegible] obtenuerit Ol Worm in Muſæo, page 115

‡ Theſe are, doubtleſs, the gold mines meant by Olig Jacobeus in his Muſæum Regium, p 31 Mineræ divæ auri e fodinis Norvegiæ quarum uni intermixtam ſibi

habet

The before quoted authentic writer Mr A Berendſen, in the ſame place, ſays, that a large ſpecimen of the gold ore found on the ſide of Agde, being ſent to Copenhagen, the concluſion was, that it would barely anſwer the expence of working it, upon which it was diſcontinued The like may be ſaid of that ſmall mixture of gold, which is often ſeen, not only in the Norway-ſilver, but even in the copper The charges of ſeparating and refining it, leaving no proſpect of further advantage, and therefore the work is neglected However, my ſubject being rather the nature of things than the benefits of them, I muſt here take the liberty to contradict a writer, in other reſpects of the higheſt merit, I mean the celebrated Aloyſius, Count Marſilli, whoſe works have gained him ſuch an extenſive reputation, who ſays, that hungary is the only country where ſilver is found intermixed with gold; of which our miners know the contrary *

SECT III

As to the northern ſilver-mines, which are unqueſtionably one of the greateſt diſtinctions of this country, I muſt premiſe, that excluſive of thoſe at preſent in work, namely, Konſberg and Jarlſberg, ſome were found formerly, and more of late, but have not been rightly ſearched, or the working of them has been diſcon-

hoc est minerium, quod quartzum metallurgis appellatur, altera pyritis ſpeciem, quæ [illegible] A 1644, [illegible] metallicus in Norvegia præfectus mineram quoque [illegible] Nedeneceſh) prope portum Arndalenſem [illegible] referente Wormio Here I add, from good information, [illegible] ſkilled in mining, were by his majeſty's order ſent to [illegible] into the truth of a report, that the river, otherwiſe famous for its [illegible] had a kind of gold [illegible] at its bottom like the Niger in Africa, but [illegible] this ſuppoſed gold being only particles of ſulphur, of [illegible] of no value But about two years ago, a conſiderable quantity of [illegible] bits of gold was found near the diſtrict of Salten, in Nordland, among [illegible] Korſvig, formerly the palace of a petty prince, this having [illegible] orders were given for further ſearch, but theſe were alſo [illegible] of that ſpot where they were found, nor of [illegible] left there ſome ages ſince, by the inhabitants [illegible] for they were little golden images, but made with a mere thin Go[illegible] like the Simulacra aurea Bornholmenſia, treated of by [illegible] Chriſtopher [illegible] three ſuch pieces are in my [illegible] and the figures are thin laminæ, with golden [illegible] one is about the bigneſs of a finger's joint, another bigger, and [illegible] the head is on the upper part, a wheel with a ring in it

[illegible] Hungariæ regionem, quod [illegible] in tot regionibus [illegible] Bohemia [illegible] ſeptentrionalibus locis argentum ſolummodo, [illegible] occupetur Secus vero [illegible]

tinued

tinued Of this kind are the ſeveral old mines in upper Tellemark, long over-grown with moſs and graſs, but which were formerly wrought in the ſame manner as thoſe of Kongſberg. They are mentioned by Baron Holberg, in his preſent ſtate of Denmark and Norway, and as he is of opinion that they are of very ancient date, he expreſſes ſome ſurprize, that not the leaſt mention is made of them by hiſtorians, ſince by their remains, they appear to have been a work of vaſt charge and extent, perhaps not inferior to any of the ſilver-works in Kongſberg. This complaint of the Baron's is the more excuſeable, as at the firſt publication of his book, the Annales Nic Kraggei, which had long lain dormant, had not yet ſeen the light, but there he would have ſeen that theſe deſerted mines were of no longer ſtanding than the reign of Chriſtian III and worked at the expence of that monarch, but the Norway-peaſants raiſing a tumult againſt the Saxon miners, to whoſe command they would not ſubmit, as ſpeaking a foreign tongue, for which ſome were capitally puniſhed, and likewiſe on account of the floods which broke out from the caverns, this work was ſoon deſerted, at a very great loſs The words of the aforeſaid Nic Kraggei, concerning this affair, in his Vita Chriſti III in Annal ad A 1539, p 204, are as follows " Coeptum erat ſuperiore anno in Tilemarchia, provincia Norvegiæ, e viſceribus terræ, argenti, cupri et plumbi metalla eruere, ac probata materia, Electori Saxoniæ aliiſque ejus rei peritis, ad quem ſuper hoc negotium aliquoties Scriptum, magna ſpe arceſſita ex Miſnia operæ, mandata cura et inſpectio primum ſtigoto Baggoni, inde Antonio Bruſchio, moderatore operarum Johanne Glaſſone, ac immunitates indultæ, prout in fodinis miſnicis tum jura condita, quibus operæ regerentur Nihilominus tamen illæ ruſticis abutentes inſolentius agebant Eo magis dolebat miſeris, *quod præter ſolitum onera imponerentur*, nullo emolumento Simul quia res erat cum hominibus, quibuſcum nullo linguæ commercio tam brevi familiaritas intercedere potuit, alienati magis animi Itaque coierunt aliqui parœcianum ruſtici, ut operantes aut affligerent, aut ex locis expellerent Sed petulantia ipſorum a præſidibus, quos dixi, refrenata Ac paucis quidem poſt, mandato regis, extremo ſupplicio affecti, reliquis alia mulcta arrogata, prout quiſque culpæ affinis, aut à nova immunis reperiebatur,

tur, quum de ſceleris autoribus eſt inquiſitum Verum, quum initia fodinarum laeta fuerint operæ pretium, diu tamen non admodum factum Nam in paucis annis rex fatigatus ſumptibus illi nexhauſtis laboribus ceptum diſtruere Cauſa ferebatur quod emanabat tantum aquæ a cavernis terræ, ut penetrari, quo neceſſe eſſet, ſine ſubmergendi periculo non potuerit

Afterwards, page 282, ad an 1545, he ſpeaks of another tumult in oppoſition to the oppreſſive violations of the liberties of the peaſants on account of the mines It is poſſible that the ſame turbulent ſpirit with which at that time, under the pretence of chriſtian liberty, the peaſants in Germany were animated to take arms againſt their ſuperiors, in their famous ruſtic war, might alſo have ſpread its infection here, though nothing certain can be advanced on this head

Formerly, likewiſe, a ſilver-mine was worked at Heddemark, which according to the account of A Berndſen, in the year 1630, yielded a ſtone of fine ſilver, and gave hopes of opening more grooves in that country, but nothing further has been heard of it. Likewiſe in Egei, and Telemark, ſilver-ores have been found producing eight ounces and a half of pure ſilver per quintal Of other conjectures and reports of ſilver-ore diſcovered in Ryefkelt, Hardanger, Sundfiord, and other northern provinces, there is no ſpeaking poſitively, till they have undergone the examination of perſons verſed in thoſe matters, nothing being more common here than upon a peaſant's growing ſuddenly rich, a whiſper flies about that he has found a rich ore and conceals it for his own private profit, though this is generally no more than the ſuggeſtion of envy That new Solem in the manor of Lavigen, on the borders of Sundfiord, there is a river in which is found the ſcoriæ of ſilver-ore, I have unqueſtionable information from the preſent miniſter there, Mr Thomas Sommer, in a letter of the 16th of October, 1750 There is likewiſe a dubious report concerning ſuch a river in Sondmoer, in the parish of Oerſkoug An exhauſted ſilver-mine in the parish of Rimen in the government of Helgeland, has alſo long been talked of, but this was only copper-ore, and ſo poor, as never to requite the charge and labour However, at the inland extremity of this diſtrict, on the borders of Sweden, is a mine containing both ſilver and lead ore, and diſcovered by the

Swedes

Swedes in the laſt century, but ſince, by order of the lord of Aluen, demoliſhed by the Norvegians, not to mention, that from its ſituation it was difficult to be wrought Likewiſe ſome copper-ore has been found with mixtures of ſilver, as that lately diſcovered at Odal, where, in the groove called Langaaſen, every quintal of ore yields ſixty or ſeventy pounds of copper, and four ounces of ſilver intermixed, but leſs in other parts

But without dwelling any longer on theſe, I ſhall proceed to give an authentic account of the two rich ſilver-ore works, which are now carrying on, to the vaſt advantage of the ſovereign and community, and theſe are the works of Kongſberg and Jareſberg

SECT IV

The firſt mine which lies near Sandſweird in Numedale, four Norway miles from Drammen, is, at preſent, to the beſt of my knowlege, the moſt conſiderable and of the greateſt profit of any in Europe, and in reſpect of pure maſſy-ſilver veins, quite inexhauſtible, whereas the German ſilver-ore is in a great meaſure inviſible, and muſt be extracted from the lead and copper, in which it is concealed This work began in the year 1623, and was diſcovered in the following manner, two peaſants, by name Jacob, and Chriſtopher Groſwald, attending their cattle on thoſe ſteep mountains, which ſeparate Telemark from Numedal, found the firſt ſilver-ore in ſome lapideous fragments fallen from the mountain, and which by way of paſtime they uſed to throw at one another, when they heard a jingling ſound the metallic ſubſtance it yielded they imagined to be lead, and carrying it home, attempted to melt it into bullets, buttons, and the like, but their fuſion not rightly ſucceeding, they ſold their ſtore to a goldſmith of Kongſberg, who uſed to ſell his goods about the country He informed the government of it, and the affair being laid before the king, orders were given for a further ſurvey of thoſe parts, which was attended with ſuch ſucceſs, that at a ſmall diſtance from a church which then ſtood there, beſides the rich veins of ſtone, a lump of pure maſſy ſilver of a pound weight was found Hereupon Chriſtian the fourth, was pleaſed to give his name to the firſt groove, and miners were ſent for from Germany Theſe were the firſt inhabitants of the new built mine-town of Kongſ-

The preſent flouriſhing mine at Kongsberg

berg, and the anceſtors of the many thouſands at preſent living there, who in proceſs of time mixing with the Norvegians, each nation to this day performs divine ſervice in its own language; but all are under the direction and government of the college of miners This laſt however, has been ſubject to ſeveral changes and revolutions, the work having been carried on ſometimes by a company of ſharers, and ſometimes, as at preſent, by the king alone A more particular account of theſe things, as it has no neceſſary relation to my preſent deſign, is to be found in Baron Holberg's preſent ſtate of Denmark and Norway, and inſtead thereof, I ſhall ſubjoin ſome phyſical remarks communicated to me, at my deſire, by perſons of unexceptionable knowlege and judgment

The firſt method uſed for the diſcovery of the mines, was by the motion of the virgula divinatoria, when it was perpendicular over the ore, but this was ſoon laid aſide, as ſometimes miſleading the ſearchers, and occaſioning a fruitleſs labour They then followed the way diſcovered by the ſpringing of the rocks, which was naturally pointed out by the ſtrata of the mountains, and the ſtreaks of the veins A remarkable particular here, is, that whereas in Germany, and Bohemia, the ore-ſtreaks run north and ſouth, here in Norway their direction is eaſt and weſt, except in that of Gottesgave, which departs from this rule, and takes the courſe of the foreign mines Though ſome are of a different opinion herein, and affirm, that the fineſt veins of ore here are without any order or regularity, ſo that they cannot properly be ſaid to be of any certain direction The Kongſberg-ore is likewiſe different from the foreign in hugeneſs, formation, and ſolidity, for whereas the ſilver mines in other parts contain ſome, though but a little ſilver, and that looſe and diſperſed, the northern mines, as has been ſaid, produce maſſy lumps or veins, or ſtreaks [illegible] In theſe we frequently meet with very curious luſus naturæ, as they are called, of ſeveral figures, a piece of that of Kongſberg, which was in my poſſeſſion, but is now in the royal muſeum, has ſome likeneſs to a ſhip with maſts and ſails, and another which I ſtill have, with the help of a little imagination, repreſents a cock, or ſome ſuch fowl Theſe ſolid lumps of ſilver, which are ſo far unknown in other parts, that foreigners will believe no

I ſuch


The Konigsperg Mines of pure Silver

such thing without ocular proof *, being soon interrupted and dwindling to nothing, the miner must continue to dig through the barren rock, till he has the good fortune to find more, which in one day will reward the labour of a whole month, or even of some years, so that hope may be said to be the spirit of this work, through so many interstices, by which the workman must not be discouraged, but persevere in his search in a full persuasion, that ore leads to ore. Were it not for these barren interstices all the silver-works in Europe together could not come in competition with that of Kongsberg, the immense riches of which may be inferred from this, that after the discouragements of a long, fruitless labour, it suddenly exhibits several thousand pound weight of silver, and thus discharges all arrears and embarrassments, and animates to further prosecution. The labour therefore is never in vain, not even, when it most appears so, for some thousands of hands, who are employed therein, and of whom a list shall be given in the sequel, always earn their daily support. If this were all the profit, which however is very far from being the case, yet it would not be inconsiderable, for the acquisition of the silver by which so many families are maintained, and which thus circulates all over the country, must be esteemed a great emolument to the public. In proof of the large and rich masses of silver contained in the mines of Norway, I shall only observe, that in the royal museum at Copenhagen, a piece is preserved, which the whole world cannot produce an equal, its weight being five hundred and sixty pound, and its value five thousand rix dollars †. Be-

* Non in omnibus argenti fodinis hoc invenitur, adeo ut, an tale detur, dubitasse videatur Plinius aliique veteres. Non occurrit in Rhenanis, Noricis, Dacicis, sed in quibusdam Misnicis fodinis, licet non in omnibus; et in Norvegia in Regio monte frequentissime et tam magna copia, ut ex una lamina quandoque excindantur pondere in [illegible] centenarium librarum. Ol. Worm. Museum, p. 115.

† Of this kind of Norway silver, Olig. Jacobeus in his Museum Regium, page 21, gives the following description: Massa ingens argenti ex fodinis Norvegiae [illegible] pedali [illegible] pollicum sex longitudinem aequat, crassitiem vero in circumferentia pedum quatuor. Anno 1666 d. 4 Augusti ex fodina Norv. Regio monte, quae nova [illegible] appellatur vulgo, Nye Forhaabnings Grube, extracta est 360 librarum pondere, et [illegible] memoriae, pretio [illegible] Huic non dissimilis [illegible] anno 1630, regnante in Dania divo Christiano quarto ex fodina Norvegica quae [illegible] vulgo, Segen Gottes appellatur, eruta est, quae 3272 Imperialium [illegible] to which I shall add, that in the year 1719, in the shaft called Sun [illegible] was found a piece of pure silver of two hundred and seventy nine pound [illegible] or [illegible] two hundred and forty five pounds, in the mine called [illegible] and in the same year another weighing three hundred and four pound [illegible] God's blessing shaft, therefore [illegible] miners, who [illegible] difficulty of believing it, till their own eyes convinced them of the truth.

side,

ſides the eighteen oldeſt grooves, the names whereof are ſpecified by Arnd Berndſen, more are opened from time to time, but I ſhall here only ſet down thoſe which are worked in the preſent year 1751, which are the following

List of the ſhafts at preſent worked

In the firſt Revier

A ſhaft near Aſchebeck
A ſhaft near old Stadſmyhr
Bratte ſhaft
God's Gift, a mine
A ſhaft near Juſtice-dale
Poors mine
Chriſtian the fourth's mine
God bleſs king Frederic, a mine
God's help in diſtreſs, a mine.
Keller, a mine
Elſe, a mine
Saxony, a mine

In the ſecond Revier

King Frederic the fifth's mine
Shaft near the above mine
Prince Royal's mine
Brunſwick mine
Juel's mine
Old God's bleſſing, a mine
Sophia Magdalena's mine
Prince Chriſtian's mine
Frederic the fourth's mine

In the third Revier

Samuel's mine
Sophia Hedewig's mine
Firſt ſhaft at Samuel's mine
The ſilver track
Second ſhaft on Samuel's mine
Firſt holy Trinity mine

Second holy Trinity mine
Duke Ulric's mine.
Old duke Ulric's mine
Johannes, a mine
Firſt Concordia mine
Second Concordia mine
Glory to God alone, a mine
The Salutation mine.
The Lady Chriſtiana mine
Firſt Solomon's mine
Leadſtreak mine
Gravel-mine, at Eger

In the Fourth Revier.

Chriſtian the Sixth's mine.
Queen Sophia Magdalena's mine.
A ſhaft near it
A ſhaft near Lucky-mine
Princeſs Louiſa's mine
Ulrica's mine
A ſhaft near it
Mitlere's Winchren
The new God's bleſſing, a mine
N° 2 ditto N° 4, 5, and 9, ditto
Ramberg ſhaft
Shaft near old Anna Sophia

Of theſe mines, the beſt at preſent are the following

God's help in diſtreſs
Samuel's mine
Old God's bleſſing

Theſe have for many years paſt yielded great quantities of metal, but there are among the reſt many valuable mines, tho' not ſo conſtant in their breakings as theſe In the fourth Revier, ſeven or eight years ago, the mines of Chriſtian VI and princeſs Louiſa, have yielded very fine ſilver, but theſe, as of moſt of the mines in the fourth, the richneſs of their breaches has diminiſhed

in the progreſs of the working, yet they are carried on with the uſual diligence, in hopes of their proving better

It has been found that the ſilver-ore is not, as was at firſt imagined, limited to this ſingle mountain, which lies between the river Jordal and Kongſberg, but extends its veins for ſome miles throughout the adjacent diſtricts, which is proved by the new mines which are from time to time undertaken in ſeveral places, and moſt of them, by the bleſſing of Providence carried on, very proſperouſly Old God's bleſſing, one of the moſt ancient and rich among all the mines, which, ſometimes, within a week, has yielded ſome hundreds of pounds of rich ore, never fails to ſtrike the beholder with its aſtoniſhing depth, being no leſs than one hundred and eighty perpendicular fathoms, and the circumference at the bottom forms a clear of ſome hundred fathoms The ſight of ſo many piles of wood burning on all ſides, thirty or forty in number, in this gloomy cavern, and continually fed in order to mollify the ſtone, in the proſecution of the mine, ſeems, according to the common idea, an image of hell, and the ſwarms of miners buſtling about in habits according to their ſeveral occupations, may well paſs for ſo many devils, eſpecially, when as a ſignal that a mine is going to be ſprung in this or that courſe, they roar out, Berg-hvet! Berg-hvet! Take care of your lives! I ſhall here briefly repeat the words of a gentleman well ſkilled in mining, Mr Emin Swedenborg, in the preface of his book called Regnum Subterraneum, where he ſays of theſe Kongſberg ſilver-mines, which are viſited by the travelling German-miners, as a lyceum in their ſcience, to which Europe has not an equal; 'Quid Norvegia in fodinis Kongſbergenſibus, ubi jam per ſeculum vix niſi argentum nativum et ſemel iterumque etiam aurum, unquam tuta melioris progenies, in lucem et diem gelidiſſimum plenſſimo ſepe cornu prodierit, cujus annuum proventum ab anno 1711, ad 1721 fuiſſe voluppe eſt, ut inde miranda naturæ phænomena in regno ſubterraneo exiſtentia luculentius contemplari liceat Ex illis fodinis ductæ ſunt argenti multam partem nativ

The height of mine

							Thal	Imper
Anno 1711,	Libræ	15483	12	ſem	inpretio		172144	56
1712,	——	15490	10	ſem	3 gr	——	171157	
1713,	——	12630	14	ſem	3 gr	——	141246	87
1714,	——	12689	15	ſem	1 gr	——	148316	$45\frac{5}{8}$
1715,	——	9034	10	ſem	2 gr	——	108154	73
1716,	——	12744	11	ſem	3 gr	——	154194	$69\frac{1}{2}$
1717,	——	21793	2	ſem	3 gr	——	276428	65
1718,	——	19685	6	ſem	——	——	257149	$19\frac{3}{4}$
1719,	——	14824		——		——	193948	$65\frac{1}{4}$
1720,	——	12760	15	ſem	3 gr	——	168992	$42\frac{3}{4}$
1721,	——	13671	10	ſem	3 gr	——	178181	$3\frac{3}{4}$
1722,	——	16884	2	ſem	——	——	222285	$32\frac{1}{4}$
1723,	——	16722	8	ſem	3 gr	——	210273	$7\frac{5}{12}$
1724,	——	14384	10	ſem	4 gr	——	186796	$5\frac{3}{4}$

A compariſon of theſe ſeveral ſums ſhews the annual produce of theſe works to amount to a tun of gold and a half, and ſometimes three quarters *, and the Almighty has in a ſignal manner been pleaſed, for ſome years paſt, to proſper theſe ſilver-works, ſince they came under the prudent management of Mr Stuckenbruch, who by his penetrating genius, has greatly improved them by ſeveral mechanical inventions, which, likewiſe to the honour and advantage of the country, have invited great numbers of curious foreigners, who with admiration here behold wonders, both in nature and art, ſuch as probably no other country can parallel.

The number of the officers of all ranks, the daily miners, labourers, and penſioners, excluſive of their children and families, who have their daily ſupport here, according to the eſtabliſhment, amount to near five thouſand perſons

In the mine of Kongſberg, the following are actually in conſtant work

	Men
In the firſt Revier - - -	650
In the ſecond - - -	600
In the third - - -	980

* From the Vienna articles in the news of June 18, 1751, it appears, that, all the ſilver and gold mine works, in the Imperial hereditary States, are not equal to the ſingle mine works of Kongſberg, the words are theſe "Since the commencement of the reign of the empreſs queen, or from the year 1741 to 1751, 1,398361 guilders have been coined at her Imperial majeſty's mints of gold and ſilver produced by the mines in the Auſtrian hereditary dominions

In

	Men.
In the fourth - - - -	900
Sawyers - - - - -	60
In the foundaries - - - -	40
In the mint - - - -	16
Carpenters - - - -	80
In the ſpring foreign peaſants are taken into work for wood and coal, and in winter, when day-labour ceaſes, an hundred men are employed in mining, beſides ſixteen men kept in conſtant pay for repairing the flat-boats, and the like, amounting to - - - - -	116
In the ſummer, the day-labour commences in June, and continues till the cloſe of November, when the men employed are at leaſt - -	200
Diſabled and ſick, receiving penſions from the mine-cheſt - - - -	300
Miners widows, likewiſe penſioners - -	500
Officers widows - - - -	30
Officers on penſion - - -	20
Officers actually in ſervice - -	50
Iſſuers - - - - - -	40
Total	4582

The number of all the inhabitants of the town of Kongſberg, amounts to betwixt ten and eleven thouſand ſouls.

The principal officers are the following:

The governor of the mine
The comptroller of the mine
Three aſſiſtants
A ſecretary
A ſuperintendant
A clerk of the mine
An officer to fix the boundaries
Four jurats
Four head-refiners
Two purveyors

A clerk of the huts
A maſter of the huts.
An aſſay-maſter.
A maſter of the mint
An engraver.
A keeper of the ſaws.
A chief foreſter
Three under foreſters
A foreſt-clerk
A phyſician and ſurgeon.

SECT V

The other Norway ſilver-mine was diſcovered in the year 1726, and begun by the families of Huſmann and Cicignon, and afterwards, in the year 1734, devolved to count Wedel It lies near Bragnas, and for wood, water, and other neceſſaries, is very conveniently ſituated, and its ore likewiſe is very rich, but without ſuch ſolid veins or maſſes of pure ſilver as thoſe at Kongſberg, the ore, like that of the German-mines, having a large mixture of lead and copper, which, in the phraſe of the miners, muſt be *made good*, and ſeparated by fuſion This operation has hitherto been inexpreſſibly difficult and laborious, and the proſecution of the work has been greatly obſtructed by the tedious labour, and exceſſive charges occaſioned by the hardneſs of the metal, or rather by the adheſion of the metal, and its intimate conjunction with the ſtone Whether this ariſes from a large mixture of arſenic and antimony, or from what other cauſe, has been a controverted point, and I muſt refer the deciſion to better judges The hand-ſtones which I have of this, contain, as I have ſaid, copper, iron, and lead, intermixed with the ſilver, yet the ſilver in ſuch abundance, that when experience ſhall have improved the preſent method of fuſion and ſeparation, and this mine comes to be wrought with more ſkill and attention, I am of opinion it will prove no leſs profitable than that of Kongſberg itſelf In the mean time the ſilver and lead found here, is ſold to the royal mint at Kongſberg at a ſettled rate The names of the mines hitherto found, and now wrought at the depth of forty-five fathoms, are upwards of twelve in number In copper-mines this kingdom has likewiſe been providentially and remarkably diſtinguiſhed, eſpecially in the

The Jarlſberg ſilver-works

mountain Nordenfield, which moſt abounds in this metal, as Sondenfield doth in ſilver and iron The excellency of our copper hath recommended it ſo much among foreign nations, that many ſhiploads of it are annually exported, tho' for the moſt part unwrought, which is contrary to the maxim of our neighbours the Swedes

SECT VI

The copper works at Roraas

The firſt, and hithe to the richeſt copper-work in Norway, and ſince that of Fahlun in Sweden, is ſaid to be near exhauſted, poſſibly the richeſt in all Europe, is that of Roraas, twenty miles N E of Drontheim, and diſcovered in 1644, by Laurence Loſſius, refiner at the mine of Quickne, and who at the expence of his father-in-law M Andrew Olſens, ſuperintendant of Dalerne, and in concurrence with him opened, and forwarded this great undertaking There are ſome other particulars relating to this work recited in a printed ſermon of Mr Peter Abildgaard, on occaſion of a jubilee celebrated on the 9th of October 1744, by the inhabitants of Roraas, which is now a conſiderable mine-town, in gratitude for the uninterrupted proſperity of their mine during the courſe of a hundred years, and it is remarkable, that in this jubilee year, a new ſhaft of excellent ſlate was diſcovered not far from the old mine of Storwart, which is one of the oldeſt and beſt courſes Theſe courſes of the copper-veins, agree in their direction with thoſe of other parts, neither aſcending nor declining, but like other ſtrata, traverſing the mountains horizontally, tho' thinneſt towards their centre, like a lump of dough, which preſſed betwixt two ſtones, is thinneſt where the preſſure lays greateſt From the nature and diſpoſition of the parts, Mr Daniel Tilas, in his diſcourſe before the Swediſh Royal Academy of Sciences 1742, borrows a very ingenious argument, and ſhews from ſome other correſpondent inſtances, what I preſume has been already evinced by me, to ſome degree of probability, in the ſecond chapter He likewiſe applies thoſe inſtances to Dr Woodward's hypotheſis on the alterations of the terraqueous globe by the deluge And this entertaining little piece not coming into my hands till after I had diſcuſſed that ſubject, to which it properly belongs, I ſhall here inſert that part of it which ſpeaks of the copper-mines now under

conſideration The paſſage in a free tranſlation runs as follows " A more than convincing proof that the mountains once were ſoft and fluid, is the horizontal and expanded direction of the copper-veins near Roraas in Norway, eſpecially thoſe in Heſtefield, likewiſe the mines Chriſtianus V Myr, and Heſteklet. This mountain is of a vaſt breadth, and riſes with a very ſteep acclivity, with ſeveral protuberances on it On the ſouth end, ſeveral courſes of ore ſpread themſelves eaſt and weſt, the eaſtern being carried on by the mine king Chriſtianus V. and the weſtern by that of Heſteklet, and theſe two mines, in length of time, would certainly meet, ſo as to open a paſſage quite through the mountain, had it not lately been obſerved of the ore-courſes, that the greater the height of the mountain is over them, the more they are compreſſed They are already ſo near to each other, that the workmen in one can hear the ſtrokes of thoſe in the other But the mine Chriſtianus V being advanced to the higheſt part of the mountain, the ore-courſe is already too narrow to be worked, and that of Heſtekler is alſo gradually approaching to the like contraction, a circumſtance which has heretofore ſhewn itſelf on all the mines, that, on coming under an eminence, the ore-courſe beneath has been compreſſed, &c Beſides, the body of the mountain itſelf, under theſe eminences, ſhews itſelf to be much more compreſſed, and, vice verſa I ſee no other cauſe to which this can be imputed, than to the primordial fluidity of this ſubſtance, and the ſubſequent compreſſion increaſing from the weight of the ſuperjacent ſtrata" So far Mr Tilas, wherein he ſeems to predict to poſterity a want of ore in theſe parts, but they who are thoroughly acquainted with the affair, are of opinion that the country near Roraas contains a ſtore for many generations, and that a want of fuel is more to be apprehended, the neighbouring woods being already conſumed, which occaſions the coal to be brought from ſome diſtance, and conſequently raiſes their price This ſhould incite thoſe, of whom it is the more immediate concern, to promote the growth of young woods, and to reſtrain the keeping of goats, which do ſo much damage among the ſiplings, for how many thouſand laſt of coal, beſide ſtacks of wood, this copper-work requires, may in ſome meaſure be conceived only from this circumſtance, that only the calcination

of

of the ore requires a freſh fire, ſix, ſeven or eight times That there are in this place, which not very long ſince was a wild deſert, great numbers who now earn a comfortable ſubſiſtence, is obſerved by M Peter Abildgaard, in his before-mentioned Jubilee ſermon, where he ſays, " It is not much above a hundred years ſince the only inhabitants of theſe parts conſiſted of ſeven or eight families, making about thirty or forty perſons, and theſe led a ſavage life, and derived all their ſupport from hunting, whereas, now, the number of this congregation exceeds two thouſand, excluſive of the neighbouring, which contain many more, and all ſubſiſt by the working of the mine "

To the Roraas copper-work belong ſeveral founderies, which for the conveniency of a ready ſupply of wood are built at a diſtance from each other, and in places, to which in winter, when the moraſſes and rivers are frozen, the ore may be conveniently carried Particularly at one place called Tolgen, four miles from Roraas, are three founderies, and of the copper for ſome years melted in them, I ſhall here ſet down an account taken from Mr Schwedenborg

Regnum ſubterraneum P 124

Year	Ship pounds of pure copper
1698 - -	700
1700 - -	1140
1702 - -	975
1704 - -	1510
1706 - -	1467
1708 - -	1460
1712 - -	1353
1718 - -	933
1722 - -	1087
1723 - -	1102
1724 - -	1128

Theſe founderies annually conſume betwixt 12 and 15000 laſts of coals, and 5 or 600 fathoms of wood

SECT VII

The medal or Lykken copper work

Next to Roraas is the medal or Lykken copper-work, four Norway miles and a half from Drontheim It is ſaid to have been diſcovered in 1654. Its founderies lie near Svarkma, and Grudſetter,

ſetter, and according to the ſame writer the produce of them has been as follows,

Year.	Svarkmæ Ship-pounds of pure copper	Grudſetter. Ship-pounds of pure copper.
1720	722	120
1721	694	261
1722	566	263
1723	478	210
1724	401	215

SECT VIII

The Indſet or Quickne copper-work lies ten Norway miles from Drontheim, and though diſcovered in 1635, was not wrought to any great effect till 1707 Its ore is of eaſier fuſion than the former, and has leſs ſtone in it, but on that account is the more ſaturated with ſulphureous particles A quintal of the ore yields 12 ſhip-pounds of copper, which require a 100 laſts of coal, and its annual produce is betwixt 3 and 400 ſhip-pounds of metal. The former director, M Broſtrup Fax, found out a method here, by precipitation, to tranſmute iron into copper, the proceſs of which is thus. Near the caverns lie heaps of marcaſites and ſcoriæ, through which water is made to run into little channels filled with bits of iron laid lengthways one below the other. This vitriolic-water carries with it the copper ſediment, and ſometimes copper itſelf, and permeates through the iron till at length it becomes copper I have a ſpecimen of this tranſmutation, though ſo far imperfect, that the internal part is ſtill iron, and the ſurface on all ſides copper Half a year is the term of a complete tranſmutation, but it muſt be carefully attended, particularly with reſpect to the time, for if it ſhould lie a few days beyond the regular period, it would be ſpoilt by the droſs and metal intermixing. The iron ſuffers a diminution in its weight, but this is compenſated in the profits of the tranſmutation I remember Count Marſilli, in his before-cited work, mentions a practice of this nature at one of the copper-works in Hungary, where the vitriolic-water, running from channel to channel, produces a like effect, and has illuſtrated his account of it with a copper-plate

The Indſet, or Quickne copper work

SECT IX

The Selboe copper mine

The Selboe copper-work lies ſix Norway miles eaſtward from Drontheim, and was diſcovered in the year 1712 The ore at firſt had a greater mixture of ſtone and ſulphur than at preſent, for it is now arrived to greater purity It is carried, the diſtance of three Norway miles, to Mollenaa, where three foundaries are erected Seven ſhip-pounds and a half of pure copper are extracted from a hundred tun of ore Which, of the before-mentioned copper-works, the curious M de la Martiniere took a view of, I know not, and much leſs with what truth he could mention a ſilver-mine within two Norway miles of it, this indeed, throws a ſuſpicion upon his whole narrative However, I ſhall here inſert it from Happel's tranſlation in Mundo mirabili

Jon III Lxvi 2

" Upon our arrival at Drontheim, we waited on the ſuperintendant general of the mines, to deliver him our letters, and deſired that our corn might be unloaded with all convenient diſpatch, but his anſwer was, that all his inferior officers being at the mines he muſt ſend a meſſenger thither, before our buſineſs could be tranſacted Upon this I deſired our captain's leave to go along with the meſſenger, which being readily granted, we ſet out early the next morning on horſeback, and came to Steckby, a large town ſix Norway miles from Drontheim, where we thought it adviſable to ſpend that night, which was coming on ſo early as about three o'clock, for we were to paſs through a large wood, infeſted by wolves, bears, and lynxes, which being very ravenous, made it more dangerous to travel in the dark We were mounted by break of day to continue our journey to the mine, and about duſk reached the founderies, where, according to the cuſtom of the country, we were liberally entertained with great plenty of beer, brandy, and tobacco It was my good fortune here to meet with an officer, who having attended a Norway nobleman in his travels, ſpoke very good French I told him, that a curioſity of ſeeing the mines had brought me thither, and that I ſhould take it very kindly, if he would be pleaſed to aſſiſt me in it, which he promiſed I might depend on the very next day, and after cementing our acquaintance with a hearty carouzal, we betook ourſelves to bed The meſſenger who left

me and returned to Drontheim, having recommended me to one of the mine officers, who the next day propoſed to carry me with him to the mine My firſt buſineſs the next morning was to go to my new acquaintance, who had prepared a good breakfaſt both for himſelf and me, and the officer, my guide, whom, during our repaſt, he deſired to ſhew me the ſeveral parts of the works Accordingly we left the foundery, which ſtands upon a high mountain near the entrance of the mine-works, and on the top of which is a crane, worked by two men, each in a wheel Theſe draw up from the mine large maſſes, ſometimes of ore, ſometimes of earth, as the free-ſtone, and potter's clay is drawn up at Paris The officer and I having ſeated ourſelves in a wooden veſſel, compacted with iron and cords, were let down into the ſhaft, to the depth of fifty fathoms Upon reaching the bottom, I could not forbear imagining myſelf in a kind of hell, nothing appearing but diſmal dark caverns, large fires, and the workmen looking like devils, all in black leathern coats, and leathern caps like thoſe our clergy wear in winter, ſloping towards the lower part, and widening upwards to faſten over the noſe to keep out the ſmoak, with aprons of the ſame The work in theſe mines is various, ſome breaking the ore, others buſy with their inſtruments in ſeeking for copper-veins or water-courſes, which ſometimes ſuddenly break out, as not long ſince was the caſe, and with ſo much violence, that without the greateſt activity in ſtopping it, the whole mine had been under water The officer who had accompanied me in this deſcent, obſerving me to be ſeized with ſhivering, rung a bell as a ſignal to draw us up again, which was done in as ſhort time as we had been let down We then returned to the foundery, where my generous interpreter had provided a good dinner ready for us, and after a cheerful meal, he, the officer, and myſelf, ſet out on horſeback to take a view of the ſilver-mine works, at two miles diſtance from thence Upon our arrival there, we went up to the chief overſeer's houſe, who very jovially bid us welcome in a glaſs of brandy, which he afterwards filled round, and this was ſucceeded by tobacco and beer in plenty After this regale he conducted us to the foundery, which was about a quarter of a mile from his houſe, and nearly of the ſame conſtruction as a copper-foundery Here the workmen were all buſy in various

employ-

employments, ſome ſeparating, ſome waſhing, ſome melting, ſome refining, and ſome forging, all for the king's uſe From the ſounderies we went to the mine works, which were in an oppoſite mountain, the officer and I went down, but I found no manner of difference betwixt this and the former, the ſhaft, fire, and garb, the method and time of working were entirely the ſame; as to the latter, it was three hours before noon, and three hours after, but in ſummer four In their leiſure they are full of mirth, dancing to a lyre of their mode, and other inſtruments, I had the pleaſure at the copper-foundery to be a ſpectator of one of their revels In the winter all work ſtands ſtill, but they receive their daily pay of five Daniſh ſhillings as in ſummer when at work"

The importance of this copper-work may in ſome meaſure be conceived from hence, that beſides the many millions which for theſe hundred years paſt have accrued from them to private perſons, the tenths alone being an annual revenue to the crown of thirty or forty thouſand rixdollars, and on the laſt Swediſh invaſion, a draught of five thouſand effective men was made out of the workmen in theſe mines

SECT X.

Fandal copper work

Laſt year a copper-work was opened at Fandal in Gulbranſdale below Dofrefield, and which the proprietors have a proſpect of turning to very good account, but as I have no particular information of it, I ſhall paſs it over with ſaying, that the name of the main groove is Frederic's gift

SECT XI

The copper work of Aardale

The copper-mine of Aardale, in the diſtrict of Sundfiord, in the dioceſe of Bergen, being diſcovered at the beginning of this century, has been wrought firſt by private perſons, and afterwards on the king's account, the ore being eſteemed very fine and good, and not without ſome mixture of gold, which induced king Frederic the fourth, to purchaſe the mine for thirty thouſand rixdollars, but afterwards, by the variation of the ore and other accidents, it has been for a long time ſuſpended, however, purſuant to a propoſal laid before the revenue-chamber, it is ſoon to be ſet on foot again

About thirty years ago a ſociety undertook the working of a copper-mine found on the iſland of Smolen, not far from the leſſer Foſen, now called Chriſtianſand, but diſſenſions, and other cauſes have put a ſtop to it On the iſland of Smolen

On the other hand, in the year 1741, a ſociety undertook a copper-mine at Oedal, nine Norway-miles from Chriſtiania, which turns out to their great advantage, every quintal of ore yielding, beſides ſome ſilver, ſixty or ſeventy pound of copper. Oedal

SECT. XII

Iron, which Pliny juſtly calls, optimum vitæ peſſimumque inſtrumentum, abounds all over Norway, but chiefly in the dioceſe of Chriſtianſand, where the ſpiritus vegetativus, ſeems to have impregnated *, all kinds of earth, according to the frequent obſervations made from chymical analyſes of water, ſtone, and mooriſh earth. Dr Nichols, in a letter of his, ſays, that, among all the ſeveral ſubſtances of which our earth is compoſed, none is more generally found than iron, this metal being reſident not only in all kind of ſtones, but alſo in loam This he proves by the colours of loam, and the iron marcaſite, by the facility of vitrifying loam, and by the ſimilitude between vitrified loam, and the iron lamellæ, by the dark red colour, which loam acquires by calcination, and laſtly, by this, that when burnt with a mixture of Of iron in general

Philoſophical tranſactions, Vol xxxv N 402

* Concerning the vegetation of all metals by means of a vitriolic ſpirit, which, according to the Creator's diſpoſition, emanes in vapours from the center of the earth to its utmoſt extremities, and particularly reſides in the mountains for the gradual growth of new metals, a great deal has been written by thoſe who believe ſuch a vegetation, though, by what I can ſee, experience is not on their ſide, no miner ſaying, that he has ever obſerved any appearance of new metal to have grown in mines after being exhauſted an hundred years or more But a more deciſive confutation of it is, what I have mentioned concerning the ore-drifts, the copper-mines at Roraas, in the ſame large flat ſtrata, as at the creation, or at the deluge However, as matter of further reflection for thoſe who may be of another opinion, I ſhall here add, what the very eminent Count Marſilli writes on this ſubject, the rather, as from the price of it, his work is not in every body's hands, in Danub Panon Tom III p 117 he ſays, "Metalli hujus (ferri) ex primo illo, juxta noſtram hypotheſin reliquis etiam nobilioribus metallis communi principio, ſeu ſpiritu metallico deducendo videtur, ſub vario tamen reſpectu ſeu gradu maturitatis, juxta majorum minoremve matricum ic ſuccorum ibi occurrentium aptitudinem And further, p 129 Attentis obſervationibus, quas hactenus recenſuimus, viſum nobis eſt, poſſe probabiliter ſtatui, communem quendam habitum metallicum ſeu ſpiritum ex penitioribus terræ (veluti ſemen ibi lege conditor s reconditum) ad ſuperficiem uſque elevari, tamque montium partes pervadere, quam ipſas planities, verum tamen congruam ipſius fixationem potiis in montibus fieri, ratione peculiaris ſtructuræ lapideæ ac ſecretionis ſuccorum ibi concurrentium ad differentiam ſtructuræ ac poroſitatis terræ componentis planities

oil, it becomes pure iron It is certain, however, that iron is not univerſally of equal goodneſs, or equally maleable, and on account of its extreme hardneſs requires an immenſe quantity of wood, and tho' not inferior in real value cannot be attended at ſo low a price as in Sweden the lower claſs of people there are under a neceſſity of working for ſmall wages, and a poor peaſant, often undertakes a little foundery of his own, being ſure of a quick vent, whereas in Norway, all the iron-ore in general is wrought at a great expence, and the ſeveral branches of it require a very opulent proprietor, or even a ſociety of proprietors Out of the moor-iron, which is found in large lumps among the moraſſes, the peaſant himſelf makes his domeſtic tools and utenſils * However next to the timber, iron is one of the moſt profitable products of Norway, ſeveral hundred thouſand quintals being annually exported, partly, and chiefly in bars, partly in caſt iron, as ſtoves, cannon, pots, kettles, and the like, the national profit of which is eſtimated at three or four hundred thouſand rixdollars Theſe iron works are the following

SECT XIII

A liſt of the iron works.

Bareboe, likewiſe called Baaſelands-works, lies two Norway-miles from Arendal; this is one of the oldeſt, and ſtill in a good condition

Barums-work, like the former, and cloſe to it Its ore is by Mr Swedenborg accounted the beſt in Norway

In Regn ſubter p 169

Bolvig's-work, not far from ſkeen

Dikkemarks-work near that of Barum, is at preſent diſcontinued

Edſvolds-work in Over-rommerige, its founderies and machines are to be ſeen in the above-mentioned place, of Mr Swedenborg's work, page 165

Egelands-work in the pariſh of Gierſtadt, is but a little undertaking

Eidsfos-work in the county of Jarlſberg

Foſſam-work near ſkeen, is one of the beſt, and famous for the great number of cannon caſt there

* In the pariſh of Vinie in Wins, is a kind of moor iron, as hard as ſteel, of which the peaſants make excellent axes, ſcythes, knives, and the like

Hack-

Hakkedals-work in Hadeland, four Norway miles from Chriſtiania

Kongſberg-work has for ſome time been intermitted on account of ſaving the coals for the ſilver-mines

Laurwigens-work belonging to the county of that name, is the largeſt and of the greateſt produce throughout the whole country

Leſſæ in Gulbrandſdale below Dofrefield, was opened a ſecond time in 1710, Mr Swedenborg deſcribes it in pag. 168.

Moſſe-work near the town of Moſs.

Neſs-work not far from Laurvigen, and belonging to the ſame proprietor

Oudals-work in the diſtrict of Solſer, the ore of this is poor

Vald near Kragerœ

Ulefos, likewiſe called Haldens-work, one Norway-mile and a half from Skeen A particular circumſtance of this work is, that the iron-mines run under a lake, ſo that for a quarter of a mile, the roof of the mines has a deep water over it, the motion of which may be plainly heard within the mine.

It remains to be obſerved, that iron was the firſt metal wrought in this country, and many hundred years before the working of the more precious metals was thought of, and by all accounts the oldeſt works are thoſe of Eilefield near Saint Thomas's church, and in Leſſœ and Edſwold, but the moor-iron was certainly the firſt diſcovered Ol. Wormius ſays, " Tacitus refert, Gotthones coluiſſe ferri fodinas Agricola eas celebrat, quæ inter ſegnedaliam et oſterdaliam ſunt, ut et in Telemarchia ad tertium à ſeida oppido lapidem eruuntur

SECT. XIV.

By all the intelligence I have been able to acquire, tin has not yet been found in this country, but in the county of Jarlſberg, lead is found mixed with the ſilver-ore, as I have before mentioned, this lead is ſaid to have a hardneſs in it, which renders it not ſo fit for uſe in the Kongſberg founderies as could be wiſhed, and therefore it is generally diſpoſed of to the Engliſh The old grooves near Chriſtiania or Aggerhuus-caſtle, are ſaid to have been worked in ſearch of lead and copper, and not for ſilver-ore, as Agricola pretends Lead works

De Metall lib ii cap 8

But Mr. Arnd Berndſen, in his book on the fruitfulneſs of Denmark, and Norway, page 276, relates, " that in the year 1630, copper and lead-ore were found intermixed at Tellemark, and according to Nicholas Cragius, a hundred years before, and in the ſame country, a like diſcovery was made I have been informed by credible perſons, that near Foſſand-houſe, in the pariſh of Strand, beſides the iron-ore, ſeveral rich veins of lead have been found I lately had a ſpecimen of lead-ore ſent me, which, upon fuſion, proved very rich and good It came from Ryefylke, not far from Stavanger If the vein, upon farther ſearch, ſhould be found large and anſwerable, it will be found very well worth working The lead-ore, mixed with ſilver, belonging to the diſtrict of Helgeland, on the borders of Sweden, has already been mentioned

Crign Annal p 204

Eger, not far from Kongſberg, alſo affords lead-ore, and of the Jarlſberg kind, and the proprietors of the copper-work of Oudal, in the diſtrict of Soloer, have lately begun to open ſome lead-mines

SECT. XV

Quickſilver

Of the other minerals, which are commonly denied the appellation of metals, and of ſeveral kinds of foſſils, uſed for dying and painting, ſome intelligent perſons inform me that there are ſome to be found here and there in Norway, but others not at all. Great ſearches have been made after quickſilver, or mercury, but hitherto without ſucceſs, except at one place, where it is matter of great doubt whether it was originally produced there A few years ago, counſellor Stockfleth, found in a clod of earth near the houſe of Viul, as much quickſilver as would have filled a baſon, but, as after a great deal of laborious digging and ſearching no more could be found, it occurred to ſome, that this mineral was not native there, it being poſſible that the quickſilver of ſeveral looking glaſſes, deſtroyed in a fire ſome time ſince, and thrown thereabouts, might have run together and coaleſced in this lump of earth The conjecture of Th Bartholin, is ſtill more uncertain on the Gramen Oſſifragum, found in this country, which he ſuppoſes to be an indication of lead or quickſilver being contained in the earth where it grows

In Act Med et Philoſ Hafniens ad A 1673 vol ii p 1

SECT XVI

Sulphur is likewiſe to be found among our mines in great plenty, but it is not thought worth melting and depurating, as is done at Dylta in Sweden, the Iceland Vulcano's ejecting whole torrents of ſulphur *, which the company's ſhips carry to Copenhagen, in ſufficient quantities to ſerve all the powder-mills, which is the chief demand for it Sulphur

SECT XVII.

Norway affords no viſible ſalt-mines, but near Frederickſtadt is a ſaline ſpring, tho' for ſeveral reaſons it is neglected Whether this ſpring ariſes from the ſea or from any ſubterraneous mine is not clear, though from its diſtance of a Norway-mile from the ſea, it can hardly be ſuppoſed to derive from thence. I have already ſpoke of the ſalt, which in ſeveral places is boiled out of ſea-water, yet ſhall here add the following ſhort account of the royal ſalt-work near Tonſberg, to be found in Mr Muller's deſcription of Tonſberg, lately publiſhed. Salt Chap iii Page 109

In the year 1739, his majeſty was pleaſed to order ſalt-works to be erected in the peninſula of Valoe, a Norway-mile and a half from Tonſberg, which in the year 1742, was compleated under the direction of Mr Van Beuſt of the privy-council. It has two refining-houſes, each two thouſand feet in length, and divided into ſix reſervoirs, to which the water is conveyed out of the ſea by a wheel worked by horſes, and running in channels Of the ſalt-works near Tonſberg

* Among all the mountains of Norway no volcanoes have hitherto, God be praiſed, been known, though, from the following circumſtances, ſome ſuch dreadful phænomena may in the courſe of time break out In Hardanger, near Diodnehouſe, in the pariſh of Kinzerwug, is a mountain about two hundred fathoms in height, the ſummit of which, as old people affirm, a little above a hundred years ago began to ſplit and ſeparate, though then the clift was ſo narrow that an active man could leap acroſs it, but in time it gradually enlaged to nine or ten ells, upon which the owner of the houſes, according to the devotion of this country, made a vow of a yearly offering to Kinzerwug-church, ſince which the apperture is ſaid to have continued as it was, but on the other hand, that part of the mountain which lies toward the ſouth, has ſunk perpendicularly, and is gradually ſinking, this ſide, as I myſelf have ſeen, is ſix or eight ells lower than the other whether this be not a ſymptom of a ſubterraneous fire, I will not take upon me poſitively to pronounce The Turin article, in the public papers of Auguſt 21, 1751, informs us, that the mountain Plainjou, near Paſſi in Savoy, had lately burſt in the like manner, with a very copious evaporation of ſulphur, which diffuſed its ſmell all over the country, and occaſioned the people to expect fiery eruption, like thoſe of mount Veſuvius

through wears from one reſervoir into another, till it has attained its proper pungency The ſalt pans, or the large kettles in which the water is boiled, yields in two or three days two and twenty tuns of ſalt, large meaſure, the tun being computed at twelve buſhels, and each pan requires every time four or five fathoms of wood. But in ſpring, or the beginning of the ſummer, where, by the melting of the ſnows, the rivers carry a greater quantity of freſh-water into the ſea, which ſomewhat diminiſhes its ſaltneſs, the boiling requires longer time, and conſequently more wood Mr Muller accounts this ſalt better than that of Lunenburgal, tho' ſome, poſſibly from conceit or partiality, aſſert the contrary This ſalt-work has a ſeparate juriſdiction, from which, however, an appeal lies to the mincry-court at Kongſberg

It was imagined that arſenic had been found in the ſilver-mines of Jarlſberg, and to this, among other things, the hardneſs of the ore was attributed, but perſons better verſed in theſe matters, deny any ſuch thing

SECT. XVIII

Vitriol

Vitriol, the inſeparable concomitant of copper and iron, might be had here in great plenty if the preparation of it could be brought to turn to good account The Norway-company, ſome years ago, begun to eſtabliſh, near Kongſberg, a vitriol-work, which they called the Loſt-Sons, but that, antecedently to this, there had been vitriol-works in Norway, appears from the following words of Ol Wormius "In Norvegia ſimile vitriolum elaboratur arte, magis ad cæruleum quam ad viridem tendens colorem, verum non in maſſis, ſed in granulis aſperis et inæqualibus proſilit Viribus et facultatibus nulli cedit" The Engliſh prepare their vitriol from a kind of yellow-veined pyrites, which, after being expoſed three months to the open air, becomes fit for yielding vitriol It is hardly a queſtion, whether the like might not alſo be done here?

In Muſ c 1 p

SECT XIX

Allum

Allum, which has ſo near an affinity with the former, and contains it, is found in great plenty under Egeberg, near Chriſtiania, betwixt the ſlate-ſtrokes, and works have alſo been ſet up there, which yield plenty of vitriol as well as Allum, but the latter is

not

not eaſily ſeparated from its ſediment, ſo as to be brought to a proper tranſparency, and on this account is ſo much the cheaper* However, this ſediment makes a fine brown dye, like the well-known Engliſh oker, and ſome ſpots of this kind are found in Moraſſes, this, when carefully taken up, ſo as to be clear of ſand, is found fit for painters I myſelf accidentally alighted upon ſuch a kind of brown oker in the pariſh of Sund in theſe parts; and the iſland of Carmen is alſo ſaid to produce the like, but in the pariſh of Quælfiorden in Nordland, it is ſold at a rix-dollar the tun, and uſed for painting houſes. Ol Wormius, in his Muſ cap III p 4 makes ſome mention of two kinds of red earth in Ferro, which are of uſe in painting

A brown dye made of it

SECT XX

Cinnabar, or Minium-nativum, by all that I can learn, has not yet been found here, but ſeveral places produce very good ockra, or oker, which belongs to the iron ſpecies, or is a kind of iron-ruſt The ſamples in my poſſeſſion are of Sulen on Sundmoer, Qualœ in Ryefylke, and from Gedderen Out of the gates of Chriſtiania, near the place of execution, a vein of very good oker runs along the ſide of the declivity of the mountain.

SECT XXI.

It may be preſumed from the copper-mines, that by a diligent ſearch, rightly directed, a blue colour, like the ultramarine, or ſome ſuch, might be found, but the country near Wardehuus in Finland, on the borders of Ruſſia, produces a foſſile of a fine ſky colour, of which a gentleman lately brought a ſpecimen, by which it appears very well to deſerve a further inſpection, the connoiſſeurs being unanimous in their high eſtimation of it.

A blue colour

Near the before-mentioned houſe of Viul in Ringerige, is found a very black ſhining fine loam, and ſo fine that it follows the pencil with the ſmoothneſs of ſoap, and may be ſtiled the Norway Indian-ink † Near Stavenger, as alſo at a greater diſtance from

A black colour

* In ſome places urine is made uſe of for precipitating the ſediment, which hinders the ullum from attaining its genuine clearneſs whether this proceſs has been introduced here I know not

† I have been lately informed by Mr Gabr Hulbeg, ſuperintendant at Nordfiord, and paſtor at Gloppen, that near the houſes of Ryg and Fide, if not in other places, a kind

from the town, is dug a kind of black colour, which, in appearance, nearly resembles dried coals, and by some has been introduced for painting

A fragrant white loam

Near Aalgaard in the parish of Giesdal, in the above-mentioned province, in the bottom of a little fresh spring, is found a kind of white loam, like Terra-sigillata, and also very ductile, but the most remarkable property is, its agreeable smell like that of musk.

Terra anti scorbutica

In the Epistolæ Ol Wormii, particularly in the second part 717, in a letter to T Bartholin, mention is made of a kind of mineral-earth beneficial against the scurvey, and found near Bergen, but the particular place is not specified, and all of whom I have enquired know nothing of it, which shews the utility of placing in a permanent and conspicuous light what minute discoveries are gradually made in any part of natural philosophy The words of this learned person, in that place, are these. "Terra illa anti-scorbutica, cujus mentionem facit catalogus, prope Bergas in Norvegia reperitur; eam mihi attulit Fabricius Medicus Regius, qui ait, ejus civitatis---Poliatrum, non sine successu ad sudores in scorbuto movendos ea uti, drachma una in aqua appropriata. cum effoditur, impura valde est, radiculis et sabulo repleta: munda lentorem et pinguedinem nullam habet, sed formam pulveris refert, colore Turpethi-mineralis, ex mercurio confecti"

a kind of black earth is found, of which the peasants make a very good dye for their stuffs, which shews that it is likewise proper for painting, and might be used instead of lamp-black

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